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EMPTY Breadbasket?

The Coming Challenge to America's Food Supply and What We Can do About It

A Study of the U.S. Food System by **The Cornucopia Project** of Rodale Press

33 East Minor Street Emmaus, Pennsylvania 18049
Phone: (215) 967-5171

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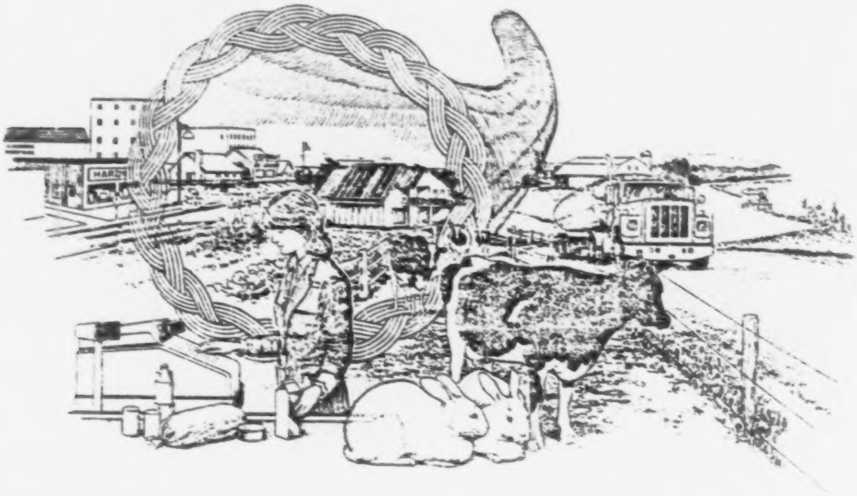

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Preface

The U.S. food system is the most productive the world has ever seen. Ironically, it is also one of the most destructive systems of all time. To provide our food abundance, we are burning up natural resources: soil, water, energy. In the midst of plenty, we seem bent on devastating our potential for future productivity.

In 1980, Rodale Press initiated The Cornucopia Project to study the entire U.S. food system. The goal was to document where our system is vulnerable, and then to suggest how the system could be transformed to sustain and conserve our resources. This report contains the results of that study.

Scenario 1: Crash

Soil erosion has eliminated about half of the originally productive farmland in the United States. Drought, lack of soil conservation measures, and continuous row cropping have led to erosion levels far worse than in the dust bowl years of the 1930's. Deserts in the western U.S. continue to expand. Billions of dollars are spent each year to remove soil from streams and waterways. Many reservoirs and hydroelectric dams have completely silted up.

All prime farmland near metropolitan regions has been built on or paved over. In Texas, Nebraska, Kansas, California and Arizona, large areas of irrigated farmland have been abandoned because of exhausted water supplies, soaring pumping costs, or high salinity. Little land is available to grow export crops.

Heavy fertilizer use is mandatory on all crops because remaining soils are lifeless mediums bereft of productivity. The U.S. supply of phosphates is depleted, and we must purchase this fertilizer mineral from OPEC -- the Organization of Phosphate Exporting Countries -- which consists of Morocco, Jordan, Egypt, and Saudi Arabia. We also import much of our nitrogen fertilizer.

Pesticides and herbicides are used so heavily and repeatedly that their application is almost continuous. Several species of formerly common animals become extinct each year. Occupational diseases reduce farm workers' life expectancy to below 50 years.

Despite the heavy use of chemicals, insect damage increases substantially. Herbicide-resistant weeds compete with food crops and reduce productivity. New bugs take hold in the U.S. and destroy significant portions of the harvest. Since only a few varieties of major crops are grown, a new strain of rust destroys half the Midwest wheat harvest. Coastal areas are over-fished and polluted, and total fish harvest is down 50 percent.

The nation's petroleum supply is dangerously short. Food processing and packaging use three times as much energy as food production. The fuel needed to plow, cultivate, harvest and transport food is often unavailable. Natural gas for production of nitrogen fertilizer is scarce and the price skyrockets. Earlier in this decade, before our domestic supply of oil and gas was depleted, foreign oil was cut off by a Mideast war. As it was, however, the U.S. could no longer meet its imported fuel bill.

Coal is now the predominant fuel. Montana, Idaho, Wyoming, West Virginia and Pennsylvania have been extensively strip-mined. Because of extensive fossil fuel use, carbon dioxide levels in the atmosphere have increased dramatically. The planet's temperature has risen 2° C., and dry land farming is difficult in Oklahoma, Iowa, and Kansas. Acid rain has killed most fresh water lakes in the eastern U.S. Forests are cut down to provide firewood. Solid waste disposal costs the U.S. $5 billion annually.

The family farm has virtually disappeared, and only a few prosperous small towns remain. There is a sort of modern feudalism in the rural areas of the country, where social classes are sharply divided between those who work on the land, those who manage it, and those who own it. Land prices are so high only large corporations can buy it, and average farm size is 2,000 acres. Farm productivity continues to decrease, and most of our food is grown on about 10,000 highly automated megafarms.

Fewer people work on farms and in the food system as a whole. Consumers buy 90 percent of their groceries from three supermarket chains. National strikes of supermarket workers occur periodically. To reduce spoilage and minimize handling problems, these stores have eliminated fresh produce, and sell only highly processed foods. New food businesses are nearly impossible to start because capital is in short supply and interest rates are more than 25 percent.

Malnutrition is rampant throughout the country. Fresh food consumption has been reduced to negligible levels. More than half the population is on food stamps, and the annual cost of the program approaches $50 billion. Obesity is a problem for 80 percent of U.S. women and men between 40 and 60 years of age. Serious vitamin and mineral deficiency affects 20 percent of the population, while many more suffer from "junk food malnourishment." About $15 billion is spent on alcoholic beverages each year.

Almost every major metropolitan area experiences periodic food shortages. Food prices are astronomical -- a loaf of bread costs over $10, tomatoes are pushing $3 apiece, and a 10-ounce jar of instant coffee sells for $50. The amount of disposable income spent by the average person on food rises from 20 to 40 percent. The poor are forced to spend as much as 60 to 80 percent of their income on food. The food stores that remain open are heavily guarded, and in many places gardens become impossible to maintain because of thievery.

During food shortages in several places, hungry people panic and loot grocery stores and warehouses. People begin to hoard food and the supply becomes even scarcer, leading to more hoarding. Famine strikes several cities in the eastern U.S., and the national guard is brought in to help distribute food.

Around the world, there are numerous famines after each poor harvest. U.S. food is not available in any large quantities for export. In some places, massive famines occur. Governments break down, and local skirmishes mushroom into wars. International order disintegrates completely.

Scenario 2: Soft Landing/Abundance

Through the combined efforts of farmers, government programs, and an educated public, soil erosion is reduced to manageable levels. The necessity for silt removal from the nation's waterways is almost eliminated.

Soil building programs are underway throughout the U.S. Millions of acres are being reforested. Expansion of U.S. deserts is checked, and some have become agriculturally productive. Several desert plants are being cultivated for their food or energy value.

Urban sprawl onto prime farmland has been halted through a combination of local, state and federal programs. The nation's prime farmland is declared a national trust and is protected as such. Farmers receive full development rights benefits through tax credits, but land speculators are excluded from this program.

Beef feedlots are decentralized, and brought closer to local grain sources, cutting down on transportation and eliminating the need for energy-intensive grain drying. Most farms grow a variety of crops and animals, so organic wastes are produced close to the fields they fertilize. The animals produce food and fertilizer, and also use rangeland that would otherwise be unproductive.

New crop varieties make dryland farming more profitable in the West and Midwest. The pumping of groundwater for irrigation is brought into balance with the water table's recharge rate. Drip irrigation and other water-conserving techniques are used on all irrigated farmland.

Chemical pesticide use is drastically reduced, having been replaced by biological pest controls. The shift from extensive monocultures to locally adapted varieties reduces insect damage to crops by 20 percent. Occupational hazards of farming are reduced significantly, and the life expectancy of farmworkers begins to exceed the average.

Much of the food system is powered by renewable energy sources. Farms, depending on their local geographical and climatic conditions, use windmills, solar cells, small-scale hydro and cogeneration units to produce electricity. Passive and active solar units, methane and methanol provide heat and portable fuels. Nearly all organic wastes are being used as fertilizer, and chemical fertilizers are seldom needed.

Small family farms are increasing in number as more and more young people -- of both sexes -- enter farming. Since small farms use resources most efficiently, they can compete successfully with large farms. Rural population increases, and local communities become vibrant developing economic centers. Stable land prices have made speculation impossible.

Malnutrition is rare in the U.S. Extensive education campaigns reduce the sales of junk food, alcohol and tobacco by 50 percent. The incidence of obesity and diet-related diseases is reduced significantly. Consumption of fresh vegetables, fruits and grains increases, while consumption of fat, salt and processed food decreases.

Major metropolitan areas of the country are reorganized to include Departments of Food, which aid and encourage local food production and distribution. Some cities expand their boundaries to include enough farmland so that they are largely self-sufficient. Urban gardens, greenhouses, aquaculture pools, farmers' markets and other food outlets proliferate.

Grocery stores and neighborhood food co-ops contract with local farmers for their food supply. Larger grocery stores install canning, drying and freezing facilities to process food produced by their shoppers. The price of most foods stabilizes, and only produce shipped long distances continues to escalate in real price.

The long distance transport of fresh produce virtually ceases, as production is decentralized and different regions of the country become more self-sufficient in fruit and vegetable production. New crops, such as amaranth, provide increased food diversity. Fresh salad greens from home and neighborhood solar greenhouses are available everywhere throughout the year. Pollution of lakes and rivers is reduced, and fishery yields are managed to assure a renewable supply.

U.S. food exports decline as developing countries increase their own food self-sufficiency. Famines occur only rarely. Surplus grain produced by the U.S. goes into an International Grain Reserve for disaster or famine relief, or is used to produce energy. World health levels and life expectancy increase dramatically.

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These scenarios are not predictions. But neither are they created out of nothing. Both of them suggest real possibilities for America's food future.

The scenario for disaster shows how things could look if we simply extend the trends and problems of the present into the future. But as dismal as this picture is, the reality could be much worse -- and may arrive faster than anyone thinks. The U.S. food system, like a rubber band, is being stretched to the extreme. So far it has managed to snap back into its original shape. But the pressures on the system are growing. One day it may be stretched too far, and break.

The scenario for abundance could also become fact. All we need to achieve it is to direct our food system into sustainable paths. The needed changes would not require any new technology or resources. We have the people, and the know-how, to build such a system. All we lack is the will to do it.

CONTENTS

Page

PREFACE 1

CURRENT AND POSSIBLE DIRECTIONS FOR THE U.S. FOOD SYSTEM 2

1. Scenario 1: Crash
2. Scenario 2: Soft Landing/Abundance

TABLE OF CONTENTS 9

THE CHALLENGE 10

1. The Success and Vulnerabilities of the U.S. Food System
2. Economic Structure
3. Food Transport
4. Land Use/Soil Abuse
5. Monoculture
6. Energy
7. Mineral Base
8. Environmental Impacts
9. Water
10. Climate
11. Nutrition/Health
12. Food Processing
13. Fisheries
14. Forest Resources
15. Urban Food Systems
16. Food Assistance
17. International Dimensions

WHAT WE CAN DO ABOUT IT 111

1. Goals for the U.S. Food System
2. The Cornucopia Agenda: Finding the Path to Food Security
    a. Farmers
    b. Consumers
    c. Food Industry
    d. Cities
    e. States
    f. United States
3. Summary/Conclusions
4. Notes

APPENDIX 177

1. Cornucopia Op-Ed Ads
2. Background and Acknowledgements

1. The Success of the U.S. Food System

The American food system is a productive wonder. Less than three percent of our population live on farms,[1] yet these people grow enough to feed the United States and provide more than 85 percent of the world's surplus food as well.[2] A farmer of today can produce 33 times more corn per hour of work as the farmers did 60 years ago.[3]

Feeding people is the country's biggest business. Annual food sales now top $300 billion,[4] and the food industry employs 1.7 million workers.[5] In addition, agriculture makes an important contribution to our balance of payments. In 1980 we exported some $40.4 billion worth of food. Our food imports cost $17.3 billion.[6]

U.S. farmers are supported by an extensive agricultural education and research system, which includes the Land Grant Colleges, the state agricultural experiment stations, and the United States Department of Agriculture's Extension Service. These programs reach into all 50 states, produce large numbers of trained workers and perform the research that has transformed the face of agriculture throughout the world. In 1980, the USDA spent over $664 million on research.[7]

The achievements of this research system are staggering. Yields for basic crops have been dramatically increased. Corn yields, for example, have more than doubled since 1945, while potato yields have risen four-fold since 1915.[8] Disease resistance, ability to utilize fertilizer, and drought resistance have been greatly improved for most crops. Animal diseases have been brought under control, and new, more productive varieties of livestock have been developed. Even some vitamins were first discovered by agricultural researchers seeking to improve animal feed.

All these factors benefit American consumers, who, on the average, use only 13.6 percent of their personal income for food, compared to as much as 60 percent in some developing countries.[9] Our food is reasonably priced, despite the fact that we enjoy an amazing diversity of fresh food all year. And if one region suffers from drought or crop failure, another region's surplus can be brought in to prevent any calamity.

Our bounty has blessed other nations as well, helping to keep millions of people from starving to death. In the last 25 years, the United States has given close to $30 billion worth of food aid.[10] And we provide much of the developed world with cheap animal feed, helping to hold down the price of meat.

The Vulnerabilities of the U.S. Food System

The U.S. food system grew to greatness because our country was endowed with:

*Seemingly endless fertile land;
*A favorable climate for agriculture;
*Plentiful oil, gas, coal and water power;
*Large number of hard-working people;
*Advancing agricultural technology.

For almost 200 years, these factors combined to work wonders.

But now, the United States' food supply is vulnerable. Even though we still have large crops in years of good weather, the system's future is endangered. Just as we had large quantities of gasoline the day before the oil embargo, we now have substantial stores of surplus food.

But that could change overnight. The average U.S. city has a 2 to 3 day supply of food. Most of America's northeastern states import over 70 percent of their food.[11] Even a slight disruption could cause serious trouble. And if this flow of food were restricted or cut off, the consequences could be catastrophic.

There are, unfortunately, a wide variety of things that could disrupt this tenuous line of supply. A trucker's strike could cut it almost completely. There are over 34,000 trucks coming into the northeastern United States each week to keep it supplied with food.[12] A rail strike would also have a severe impact.

Another oil embargo or shortage would also threaten our food supply. During the last oil shortage, grocery store warehouses in Pennsylvania were out of almost 20 percent of their stocks.[13] A study by the U.S. Department of Energy disclosed that a 10 percent reduction in oil supply would result in a 55 percent increase in the price of vegetables and fruits.[14]

Our food supply could also be disrupted by a labor dispute in the main areas of production, or a Medfly-like quarantine of these areas, or a drought or other natural catastrophe. In addition, food industry executives now believe that because of union penetration, a national supermarket strike is possible.[15] Added to this already overlong list of threats to our food security must be the possibility of total economic collapse in our farming sector. Farm debt has skyrocketed in the last decade to over $160 billion -- up 290 percent since 1970.[16] A burst in the bubble of land values would bankrupt most of the farmers in the United States. Some observers argue that farmers are already bankrupt since there is no forseeable way for them to pay off their debts, or to avoid getting even deeper in debt.

Finally, we must add the hypothetical and horrible spectre of sabotage to this list. Given the state of terrorism in the world today, this is not unthinkable. Knocking out six bridges across the Mississippi River, for example, could almost stop the flow of food to the Northeast.[17]

Taken individually or in concert, these factors seriously threaten the supply of food in the United States. Unfortunately, they are only the short term threats. There are a number of systemic diseases afflicting the whole food system that could, in time, curtail or block our supply of food just as drastically as could these relatively short-range threats. Many people argue that these longer-range threats are the most dangerous because they are so pervasive.

Among these diseases are the enormous erosion of the country's vital topsoils, the loss of farmland to development, our almost total dependence on a depleting fuel supply that is escalating in price and over which we have little control, our similar dependence on a depleting mineral base, our overuse of dangerous pesticides and soil-damaging synthetic fertilizers, our non-sustainable use of water, the equally non-sustainable environmental impacts our food system is having, the threats to human health of our current diet, and our self-defeating patterns of domestic food assistance and participation in the global food system.

Our food system maintains the illusion of unlimited success. It still feeds us. But the foundation of the system is being eaten away -- slowly, quietly, yet surely. The biggest danger is that the situation may become critical before it even seems serious.

Taken together, these short-and longer-term threats add up to the most serious challenge our food supply has ever encountered. They endanger our national security. If unchecked, they will lead us to a world similar to that described in Scenario 1.

The best way to demonstrate our predicament is to look at the key parts of our food system one at a time. The following pages do this in detail. This is followed by a list of what The Cornucopia Project sees as the measures needed to transform our present food system into a sustainable, safe and affordable cornucopia.

2. Economic Structure

The economic structure of our food system is balanced on a tightrope. Without the present price supports, tax write-offs, emergency loan programs, and artificially inflated land values, many U.S. farmers would be bankrupt right now. We would fall off this highwire, and the system that feeds us would collapse.

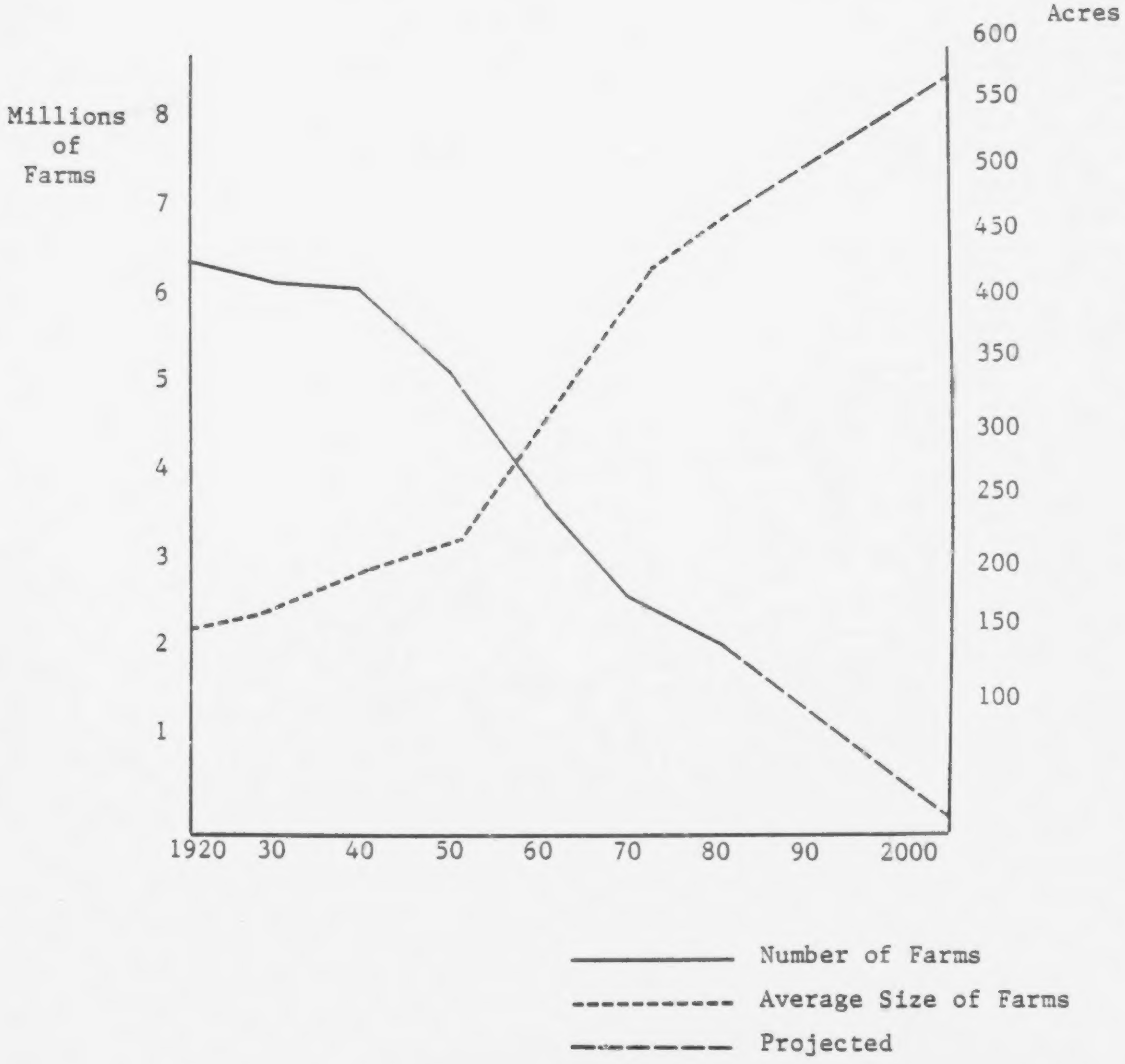
But if we stay on the wire and keep heading in the same direction, the consequences may be equally disastrous. We end up with a food system controlled by a few corporations with almost absolute power over what we eat. And the price we are currently paying to move forward is enormous: loss of farmers, processors, and locally-based grocery stores, devastation of rural communities, soil erosion, and the depletion of non-renewable resources.

It is unlikely that there is any conspiracy to destroy our food system, or to control food production, distribution and prices. But sometimes the system seems to act as if there were. And it has come to the point that the structure of our system no longer serves the best interests of anyone -- farmers, food companies, or consumers.

Farming

Since 1920, more than two-thirds of all U.S. farms have disappeared.[1] Between 1950 and 1970, we lost 100,000 small farms annually, or nearly 2000 each week.[2] Since then the loss has slowed somewhat, but it still continues. We now have about two million farms, of which about 20 percent produce 80 percent of the nation's food and fiber.[3] The largest 7 percent of U.S. farms receive over 50 percent of the total cash receipts from the sale of farm products.[4]

NUMBER OF U.S. FARMS AND AVERAGE SIZE OF FARMS



Sources: U.S. Department of Agriculture, 1979 Handbook of Agricultural Charts, Agricultural Handbook No. 561, p. 29. U.S. Government Printing Office, Washington D.C. 20250.

U.S., Department of Agriculture, Agricultural Statistics 1980, pp. 417, 418. U.S. Government Printing Office, Washington, D.C. 20250.

Studies have shown that the most efficient farm production unit is not the large corporate spread, but the basic family farm.[5] Yet farms -- and farm suppliers -- keep getting bigger. Average farm size has tripled over the last 60 years, from 150 to 450 acres.[6] Based on 1978 data, the USDA found that one percent of farmland owners control 30 percent of all U.S. farmland.[7] A related report projected that if present trends continue to the end of the century, one percent of America's farms will control half our food and fiber production.[8]

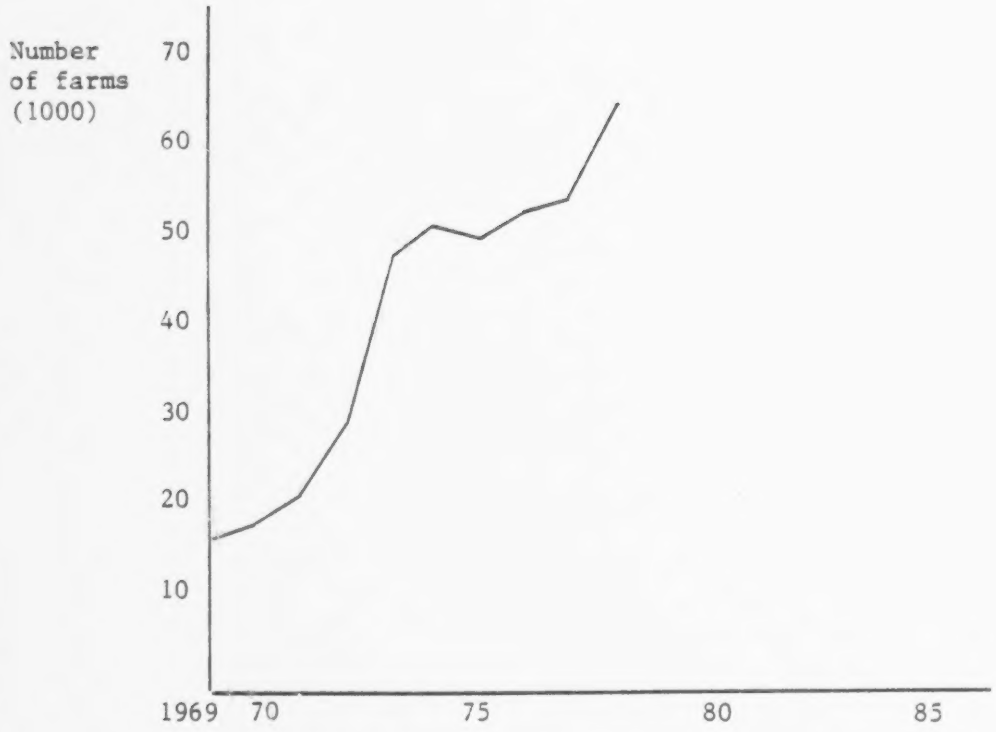
Similarly, fifteen companies account for 60 percent of all inputs to farm production.[9] Four companies now sell 80 percent of all combines; two companies sell 79 percent of all cotton pesticides; two companies sell 50 percent of all corn herbicides, and four companies sell 75 percent of all tractors sold in America.[10]

Current laws encourage the trend toward giantism. Tax policies favor large operators, and subsidy programs benefit the largest producers most. In 1978, nearly half the total U.S. farm commodity payments of $2.03 billion went to just 10 percent of the farmers -- those with the biggest farms. Half the farmers -- those with the smallest farms -- received only about 10 percent of the payments.[11]

Hidden subsidies may also favor farmers in one region or area. California agriculture, which now supplies more than 40 percent of the country's fresh produce,[12] has received a multi-billion dollar subsidy through federal water and irrigation projects. Estimates are that nearly 20 million acres of agricultural land in the East have gone out of production as a direct result of federally-funded projects in the West.[13]

Along with the increase in farm size has come an increasing dependence on technology. A new technology is usually measured against the sole criteria of

NUMBER OF LARGE (VALUE OF SALES OVER $200,000) FARMS



Source: U.S., Department of Agriculture, Farm Income Statistics, National Economics Division, Economics, Statistics and Cooperative Service, Washington, D.C.,October, 1979, p. 52.

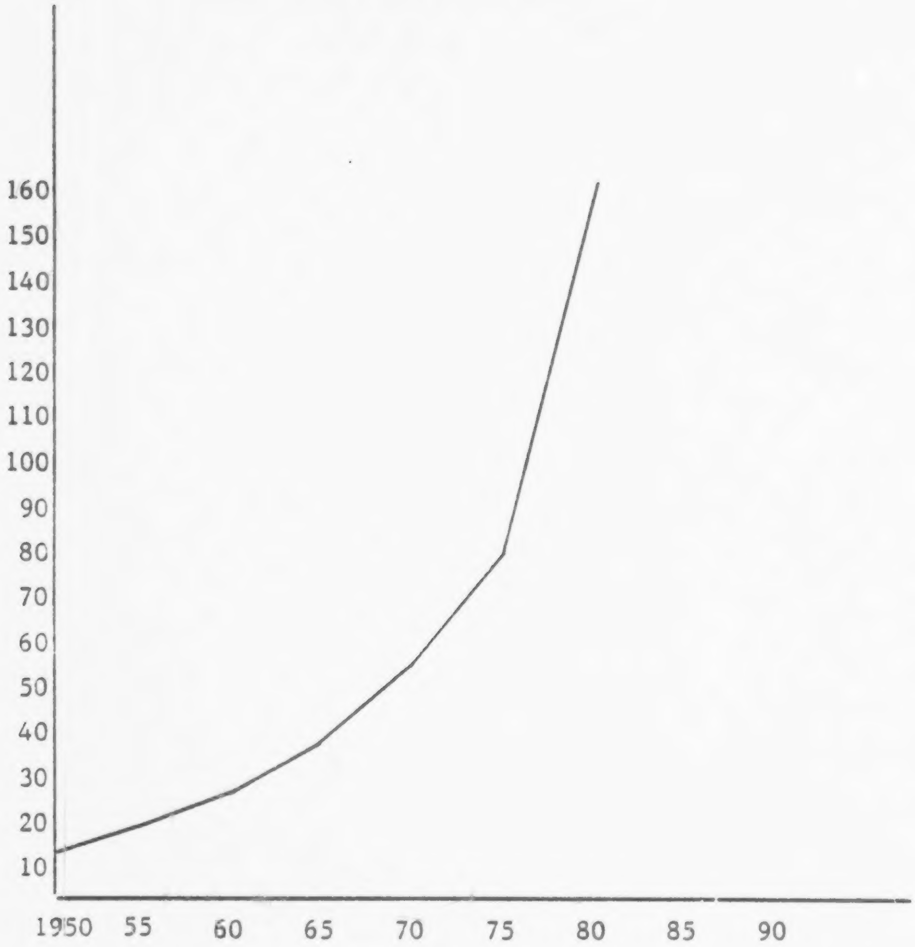
short-term economic efficiency. If it passes this simplistic test it is usually adopted. New, super-large tractors and harvesters, for example, argue persuasively for larger and larger farms. Once these behemoths are purchased, the farmer must expand his operation so that these expensive machines do not stand idle. Ever-larger farm machinery impels ever larger farms, leading to more soil erosion (large machines cannot handle soil conserving terraces and contours), increased soil compaction, more fuel use, fewer farmers, and a more vulnerable, fragile agriculture.

The cost of this large machinery has also helped contribute to increasing farm debt. Despite the vast wealth of the U.S., the richness of our soils, and our technological know-how, many farmers are in dangerous financial shape. Farm debt is now over $160 billion, a rise of 650 percent in the last 20 years.[14] That's an average of over $68,000 for every farmer in the United States.[15] Predictions are that if current trends continue until 1990, farm debt will reach $600 billion.[16]

The farmer is pushed into ever-increasing debt through a variety of structural factors. Perhaps because of a previously bad year or because he wishes to "get ahead" and expand his operation, the farmer borrows at the beginning of the year to finance the seeds, fuel, fertilizer, and pesticides needed to farm. If he has a poor harvest, this debt cannot be fully repaid, and the next year he will have to borrow even more. Then he has to earn at least 10 to 15 percent more each year -- whatever the inflation rate is -- just to break even. Once in this downward spiral, it is difficult to escape.

Ironically this debt cycle would probably have ended long ago without runaway inflation. It works like this: In order to stay in business the farmer has to borrow more money from the bank. To borrow this money he needs more collateral. Inflation, which drives the price of his land ever higher,

UNITED STATES FARM DEBT



Sources: U.S., Department of Agriculture, Agricultural Statistics 1980, pp. 477, 483. U.S. Government Printing Office, Washington, D.C.

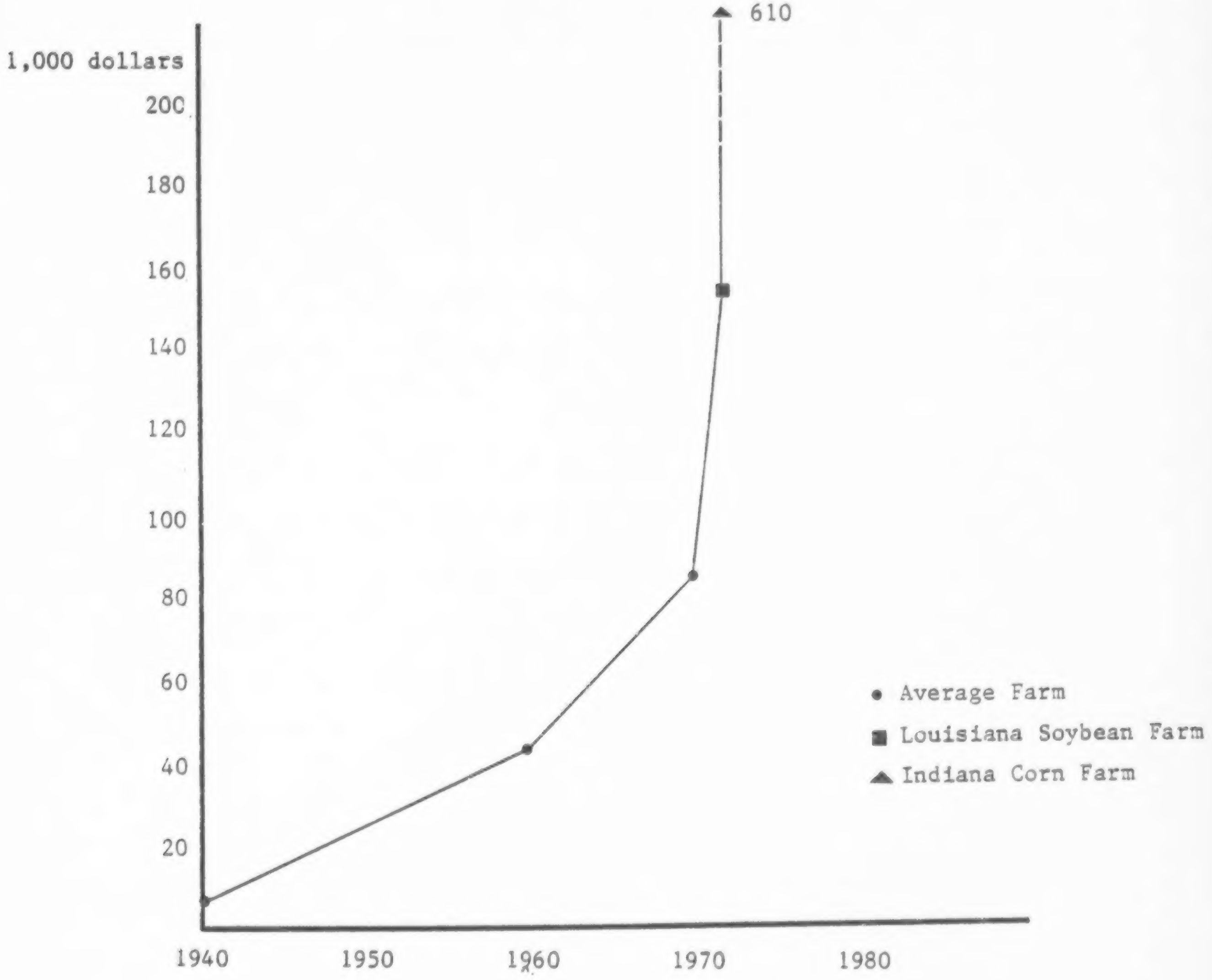
U.S. Department of Agriculture, 1979 Handbook of Agricultural Charts, Agricultural Handbook No. 561, p. 10, chart 12. U.S. Government Printing Office, Washington, D.C., gives him that increasing collateral. Without skyrocketing farmland prices (since 1970 farmland values have increased an average of 245 percent[17]) the farmer would not be able to finance next year's operations, or refinance his old debt, or make payments on outstanding debts. Bankruptcy could easily result.

If the inflating bubble of land prices burst, as some economists are forecasting, or even if land inflation leveled off, many farmers would be left holding huge debts with little collateral or no additional equity. There would be no way to refinance or borrow money for next year's crop. This is basically what happened in the U.S. in the 1920's. Farmland values plummeted and it took nearly 25 years for prices to return to former levels.

Inflated land values have given many farmers windfall profits, and have attracted land speculators, which has driven the price of land up even further. Commenting on this situation, noted agricultural economist, Harold Breimyer says: "It is an enormous paper profit. Its benefits are brief and false and confined to a few. Its harm can be excruciating for many when the bubble bursts. No real wealth is created by a chain letter game, a lottery, or speculation in land. Any nation that tries to build upon such manipulation is headed for trouble.[18]

The potential tragedy doesn't stop here, however. Farm loans come from banks, usually smaller rural ones. These banks have outstanding loans from larger banks. If the small banks are forced to call in their debts and confiscate the farms that they now own, it is entirely possible that because of the unavailibility of capital, or the lack of qualified buyers, or the deflation of land values, they would not be able to re-sell these properties at a price that would amortize their debt. When this happened during the Great

CAPITAL REQUIRED TO START A NEW FARM



Source: General Accounting Office, Food, Agriculture and Nutrition Issues For Planning, (Washington, D.C.: General Accounting Office, June 11, 1980), p. 39.

Depression, bank failures resulted. Today there are safeguards to prevent massive bank failures, but they cannot prevent farm failures.

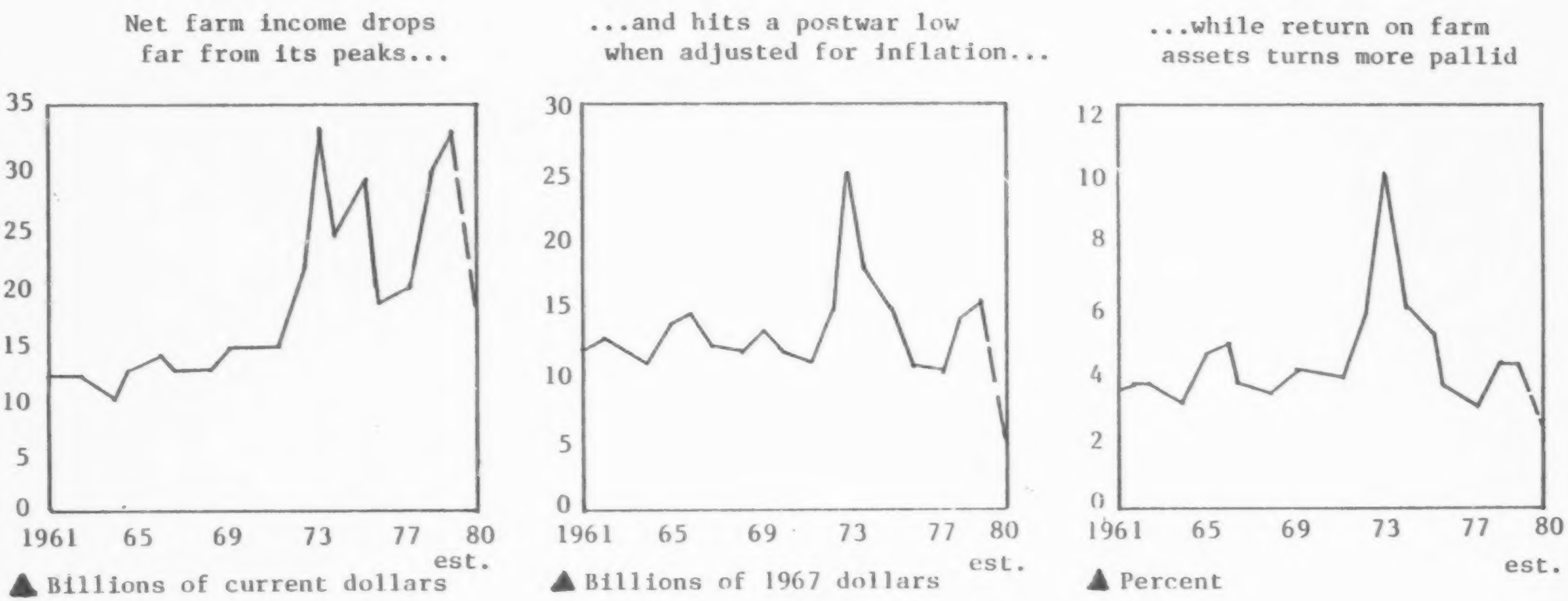
While farm debt has been soaring, income has been declining. Between 1979 and 1980, diesel fuel prices doubled. Since 1967, feed costs are up 104 percent, seed is up 186 percent, machinery is up 189 percent, and fertilizers are up 193 percent.[19] Gross farm income in 1980 rose about 6 percent to $140 billion, but because of rising costs net income plunged about 29 percent to $22 billion -- the largest one-year drop in 50 years.[20]

These rising costs have made it extremely difficult for new farmers to get started. Often, only large corporations or large farmers can afford the entry fees. A 1978 study reported that to start a farm that would generate gross sales of $40,000 to $60,000 a year, a person would need a capital investment of $573,000 for a livestock spread, or $285,000 to start a fruit and nut orchard.[21] (The farmer's income would be some part of the gross sales.) These figures are for small farms; the authors of the study suggest that if the farmer had little equity in the land and didn't have off-farm income, he would barely survive financially.

One effect of these structural changes has been a decline in farming quality and in rural life. More and more farmland is owned by absentee landlords. Technology is being substituted for farming knowledge. The farmer has become a machine operator, instead of the agronomist/ecologist/geneticist, etc., that he once was. In the last 20 years, over half of America's farmland has changed ownership, so the intimate knowledge of the land that skilled farmers need is increasingly being lost.

When the number of farmers decreases, farm suppliers eventually go out of business and the rural community suffers. Schools, roads, and other public

THE SUDDEN SLIDE IN FARMERS' FORTUNES



Net farm income drops far from its peaks...

...and hits a postwar low when adjusted for inflation...

...while return on farm assets turns more pallid

Source: "Rippling troubles from the farm belt," Business Week, July 14, 1980, p. 94.

services deteriorate. The remaining residents are left with an increased tax burden, a decaying community, and little new economic opportunity.

In the face of these massive problems, U.S. farmers have continued to produce abundant harvests. But the structure that should support them is crushing many smaller farmers. As control passes into fewer and fewer hands, competition is reduced, and our food production system becomes less responsive to individual needs and less resilient in times of stress.

Food Industry

Food is America's biggest business. The food and fiber industries employ between 14 and 17 million workers.[22] In 1980, American consumers spent $302.3 billion on food, $1400 for every person in the country. About $80 billion -- 26 percent -- paid for meals out, while the rest was spent for food at home.[23]

In recent years, food costs, like other living expenses, have risen considerably: 10 percent in 1978; 10.9 percent in 1979; and 8.6 percent in 1980.[24] But despite these jumps, food remains a relative bargain. Only 13.6 percent of America's personal spending goes for food, as compared to over 20 percent in France and Sweden, 30 percent in Spain and Italy, and nearly 60 percent in India.[25] And the percentage of disposable income consumers pay for food has declined by almost one-third since 1929.[26]

Our food dollars purchase an amazing variety of edibles. Fifty years ago, most of our grandparents ate strawberries and lettuce in the summer, cabbage and apples in winter, and oranges on special occasions. Today we can buy nearly any food we want almost any time of the year.

Despite its impressive achievements, however, the way the food industry has grown over the years has created some problems, not only for the long-term health of the industry itself, but for the nation's food system as a whole.

One problem is the trend toward consolidation that has occurred in farming, manufacturing, processing and distribution. Currently, there are more than 12,000 food manufacturing plants in the country that employ at least 20 people.[27] But just 49 companies account for 68 percent of all food processing, and 44 companies control over 77 percent of all wholesale and retail revenues.[28] Less than 21 percent of the food stores in the United States are supermarkets, yet these stores accounted for more than 77 percent of 1980 sales.[29]

This consolidation is especially pronounced with particular products. Three companies share 85 percent of the North American banana market. Four bottlers sell 89 percent of the U.S.'s soft drinks. Four firms make 91 percent of the country's cereal. Three brewers produce over half our beer.[30] And just one company makes 90 percent of our canned soup.[31]

The movement toward corporate oligarchy has some potentially dangerous side-effects. It limits efficiency, especially in the use of energy. Many giant companies do their processing in a few, huge plants, rather than in smaller, regional operations. Food is often moved a considerable distance before processing, then shipped back across the country afterwards.

The bigger the company, the less able it is to respond to individual needs, or to adapt to changing circumstances. Recently, for example, a major food company identified with dairy products announced it would no longer sell any natural cheeses. The reason: the company could not afford to hold that much product in inventory to permit the natural aging process to occur.[32]

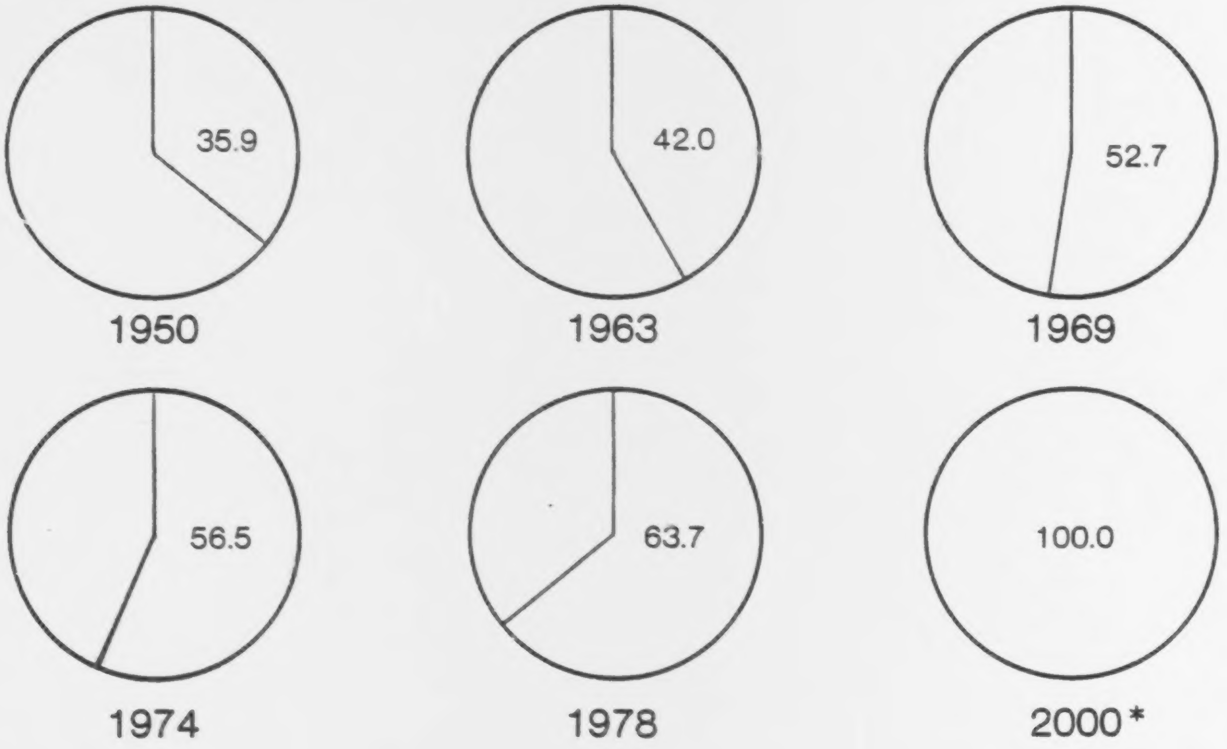
Pressured by high interest rates, the need to keep inventory turning over, and the imperative to keep manufacturing operations productive, the company decided to withdraw natural cheese and focus on higher-profit items. The practical result is that consumers who want this cheese must now look elsewhere, and probably pay more for imported natural cheese that has travelled thousands of miles. Ironically, many of the small companies that could produce natural cheese profitably have been bought out or driven out of business by larger firms.

Short-term financial considerations were also behind a 1979 decision by the country's primary soup maker that all tomatoes for its New Jersey factory would henceforth be purchased in California and Ohio, and brought east as paste. It had become uneconomic to buy Jersey tomatoes and process them locally.[33]

Once these corporate decisions are made, and procedures are established, it is very difficult to make rapid changes. For example, in the event of a sudden oil shortage, or a med-fly invasion, long supply and distribution lines could be cut, and there would be no structures in place to help create a regional food system. Major food companies, which would have the capital to develop such structures, might take months or years to get re-oriented. During the process, consumers would suffer, and the companies themselves would experience severe difficulties, and perhaps even go under.

Consolidation also tends to limit competition, and may lead to higher food prices. In a controversial food industry study, Russell Parker, a Federal Trade Commission economist, and John Connor, a USDA economist, attempted to compute the extra amount that consumers pay because of the lack of competition. Their estimate for 1980 was over $18 billion.[34] A study by two University

Percentage of the Food Manufacturing Assets Owned by the 50 Largest Firms



* Projected.

Source: John M. Connor, The U.S. Food and Tobacco Industry, U.S., Department of Agriculture, Agricultural Economic Report #451, p. 12.

of Wisconsin economists suggests that supermarket monopolies have inflated prices another $1 billion annually.[35]

A primary reason large food companies tend to buy up smaller companies is that sales growth in the food industry is unusually difficult. In many businesses, companies can expand without jeopardizing other firms because the potential market is unlimited. But that is not the case with food. Most people do not increase their consumption of food each year. And the natural population increase, by itself, is limited. So in order for a company to grow, it must buy other companies, or increase its market share by displacing another company's product to some extent.

As a result, food companies advertise heavily. The food marketing system is the largest user of national media advertising, buying more than twice as much as its nearest competitor, the automotive/gasoline industry.[36] Estimates are that in 1979 the industry spent from $7 to $9 billion on promotion. About $5 billion of this amount went for "pull" advertising, which is aimed at influencing consumers, while the remainder paid for "push" advertising directed to distributors. Advertising accounts for 3 to 4 cents of every dollar spent on food in grocery stores.[37]

Not all foods receive an equal amount of advertising. Throughout the 1970's, highly processed foods -- which have high profit margins -- have accounted for most of the total advertising budget. Perishable foods, such as unprocessed meats, poultry and fish, fruits and vegetables, and dairy products take over half of the consumer's food-at-home dollar, but they account for less than 8 percent of the national media advertising. In contrast, breakfast cereal, soft drinks, candy and other desserts, oils and salad dressings, coffee, and prepared foods take only about 20 percent of the consumer food dollar, yet they account for about half of all media advertising.[38]

Major food companies not only control a large share of food sales, they also specify the production techniques used by farmers. Food companies almost always demand a standardized product, and suggest the use of large amounts of chemical pesticides and fertilizers, and expensive machines for picking and processing.[39]

For cosmetic purposes, they demand a particular look as well. Unfortunately, such a system often requires fruit and vegetables to meet arbitrary beauty or size standards, which result in considerable waste as edible -- but homely -- food is rejected. About one-fourth of all fruits and vegetables picked in this country never make it out of the supermarket.[40]

The food industry, with its current structure, meets the basic food needs of most of us. But under increasing financial pressure, companies are being forced to act for short-term profits, without due regard for such things as the conservation of resources and the sustainability of the food system as a whole. The more consolidated the food industry becomes, the more inflexible and vulnerable our food supply becomes. If these trends are not reversed, Americans may soon have little to say about the cost -- or the choice -- of the food they eat.

3. Food Transport

America's investment in transportation is immense. We have 3.8 million miles of roads, 178 thousand miles of main-line railroad track,[1] and 25 thousand miles of navigable inland rivers and canals.[2] There are more than 100 million cars and 32 million trucks in the country -- three vehicles for every five people. We spend more than $30 billion ($150 per person) each year for highways, burn up 125 billion gallons of gasoline driving on them, and pay $60 billion for commercial truck and railroad services. Transportation uses $165 billion worth of petroleum annually, 53 percent of the total U.S. consumption.[3]

The U.S. Department of Agriculture conservatively estimates that 5.3 percent of the retail cost of food pays for rail and truck transportation. Based on this figure, Americans paid almost $16 billion in 1980 to move their food around.[4] And this does not account for transportation to and from the supermarket, nor the hidden costs such as highway construction and maintenance, deaths and disabilities from transportation accidents, air quality control programs and air pollution-induced illnesses. A U.S. Department of Defense study estimated that the average molecule of processed food in this country travels 1300 miles before being eaten.[5]

Most large shipments of food go by truck, train or barge. While railroads and barges are the most energy-efficient modes, trucks are most commonly used.[6] Except for long distance shipment of grains, trucking dominates the food freight business, transporting 99 percent of all livestock, 88 percent of fresh fruits and vegetables, and more than 80 percent of fresh and frozen meats, dairy products, bakery goods and beverages.[7]

The gradual shift from the use of railroads to trucks for food transport has made the present system increasingly energy intensive. Trucks use at least three times as much energy per ton mile as railroads,[8,9] and fuel accounts for approximately 25 percent of trucks' operating costs.[10] Railroads, on the other hand, spend less than 8 percent of their operating costs for fuel, but handle only about 22 percent of all U.S. food shipments.[11,12]

Part of the reason for the decline in the use of railroads is the construction of the national Interstate Highway System which helped to promote the trucking industry at the taxpayer's expense. From 1970 to 1979, the railroads' share of perishable foods shipments dropped 58 percent.[13] Chronic problems of long delays, inflexibility, financial hardships, and unreliability have plagued railroads and seriously reduced their ability to compete with trucks. The use of more flexible trailer-on flat-cars (TOFC) or piggyback rail service has grown in recent years, however, returning some of the long-distance produce traffic to railroads.[14]

Except for grains, very little food is shipped by barge. Despite their relative fuel efficiency, these huge boats are extremely limited in the number of areas they can serve, since few U.S. population centers are built around navigable waters. For maximum efficiency, barges must carry large amounts of food, which makes refrigeration very difficult.

At the present time, there are more than 4 million trucks in this country used primarily to transport food, enough for every citizen to have his own truck for one week every year.[15] These 4 million trucks travel 45 billion miles annually, a distance equal to 242 trips to the sun![16] Twenty-seven percent of all truck miles[17] and four percent of the domestic motor fuel supply is used just to transport food.[18] Food trucks burn up $5.5 billion worth of fuel each year,[19] expel over four million tons of pollutants into the air,[20] and cause millions of dollars damage to public highways.

Many of the problems associated with truck transportation result from the size and weight of modern trucks. The legal gross vehicle weight in many states is now up to 80,000 pounds.[21] Although the total state and federal taxes paid by large trucks are as much as 7 to 8 times that paid by automobiles on a per mile basis, the General Accounting Office has found that a single fully loaded 80,000 pound truck does as much damage to a mile of roadway as 9,600 automobiles.[22] In California, local governments spend $100 million each year to repair damaged roadbeds, and 99 percent of the damages are due to vehicles weighing more than 6,000 pounds.[23]

There are other hidden costs of transporting food which are more difficult to measure. Food spoilage and waste during long-distance transportation amount to losses of $300 million annually.[24] When a breakdown in the transportation system occurs, it is quite costly, both to farmers and to consumers. The truckers strike of 1979 caused $1 million in losses to melon-growers in Florida alone.[25]

Many taxpayers bridle at the thought of subsidizing private industries like trucks and railroads. But food transportation subsidies benefit most citizens. If they were ended, the higher costs of moving food would simply be passed on to consumers, raising food prices and hurting poor people. As long as we demand food from all over the world, we will have to pay for transporting it.

Our extensive food transportation system brings us a great variety of fresh foods all year. But this system uses huge quantities of scarce, expensive fuel, and lengthy supply lines can easily be cut by a strike, or a natural disaster, or an energy shortage. Continued dependence on such a system means continual vulnerability for our food supply.

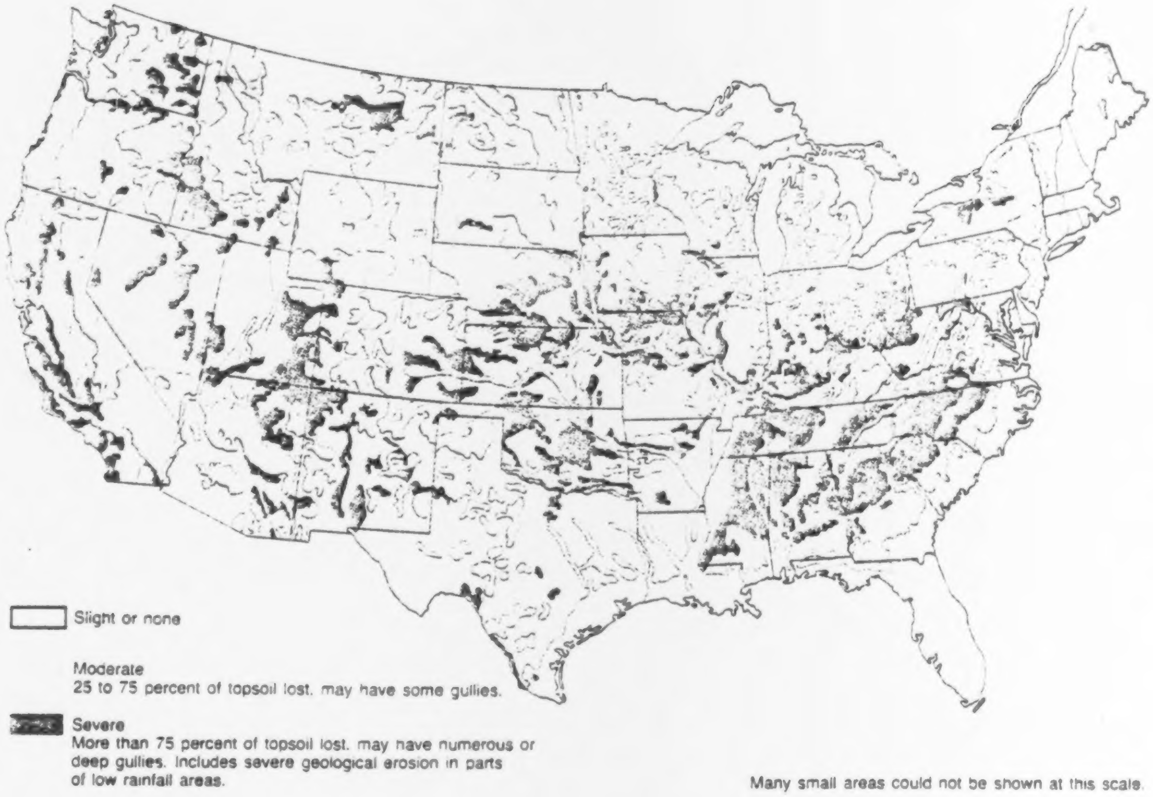
4. Land Use/Soil Abuse

Erosion is a deadly enemy of U.S. farmland. Every year, we lose about 5.8 billion tons of topsoil to erosion, more than enough to cover all the cropland in the New England states of Maine, New Hampshire, Vermont, Massachusetts, Connecticut and Rhode Island, plus New York, New Jersey, Pennsylvania, Delaware, Maryland, Alabama, Arizona, California and Florida with one inch of dirt, or to bury every supermarket in the United States under 188 feet of earth.[1] The productive equivalent of six million acres of farmland is lost every year because of erosion.[2]

The most destructive form is sheet and rill erosion, which is caused by water runoff from agricultural land. In 1977, this came to an estimated four billion tons. In addition, wind erosion moved some 1.46 billion tons of topsoil, while losses to gully erosion amounted to about 298 million tons.[3] No figures are collected for erosion caused by snow melt or improper irrigation techniques, but these losses are substantial.

In an average year, more than one-third of all our cropland suffers erosion beyond the "tolerable rate" of about five tons per acre, the maximum rate at which the soil's fertility can be "maintained".[4] Overall, the soil loss per acre of cultivated cropland in the United States averages 5.1 tons annually.[5]

In some areas, this problem is especially acute. Iowa, a prime farming state, loses almost 10 tons of topsoil per acre each year, nearly twice the tolerable rate.[6] For every pound of wheat harvested in eastern Washington, 20 pounds of topsoil are lost.[7] In Texas, wind erosion alone blows 15 tons of topsoil yearly from each acre of cropland.[8] Nationwide, five or six pounds of topsoil are destroyed by erosion in the production of each pound of corn.[9]


Slight or none
Moderate
25 to 75 percent of topsoil lost, may have some gullies.
Severe
More than 75 percent of topsoil lost, may have numerous or deep gullies. Includes severe geological erosion in parts of low rainfall areas.
Many small areas could not be shown at this scale.

Cumulative effects of erosion in the United States. (Adapted from Hunt, 1974.)

Source: Paul R. Ehrlich, Anne H. Ehrlich, and John P. Holdren, Ecoscience: Population, Resources, Environment. San Francisco: W.H. Freeman and Company, 1977, p. 258.

At the heaviest rates of erosion, we are destroying an inch of topsoil in 10 to 20 years[10] — topsoil that takes from 100 to 1,500 years to replace, depending on the climate and underlying bedrock.[11] Estimates indicate that we are currently losing 25 percent more soil than during the dust bowl years of the 1930s, despite the fact that we now have less land under cultivation.[12] At present rates of soil erosion, some major wheat producing areas of the United States have only one or two decades of productivity left, and after that the land will be suitable only for parking lots for abandoned farm machinery.

Erosion has already taken a heavy toll on our productivity. In the last 200 years, it has destroyed at least one-third of our topsoil. During this time, nearly 236 million acres (370,000 square miles) have been ruined or impoverished for agriculture by erosion.[13] In some parts of the country, the remaining topsoil is only five or six inches deep.[14]

Erosion is also responsible for the slow but steady decline in soil productivity. The soil eroded each year carries with it 10 million tons of nitrogen and 2.5 million tons of phosphorus, worth $1.3 billion.[15] Estimates are that for every inch of soil lost in the Corn Belt, corn yields are reduced by three bushels per acre.[16]

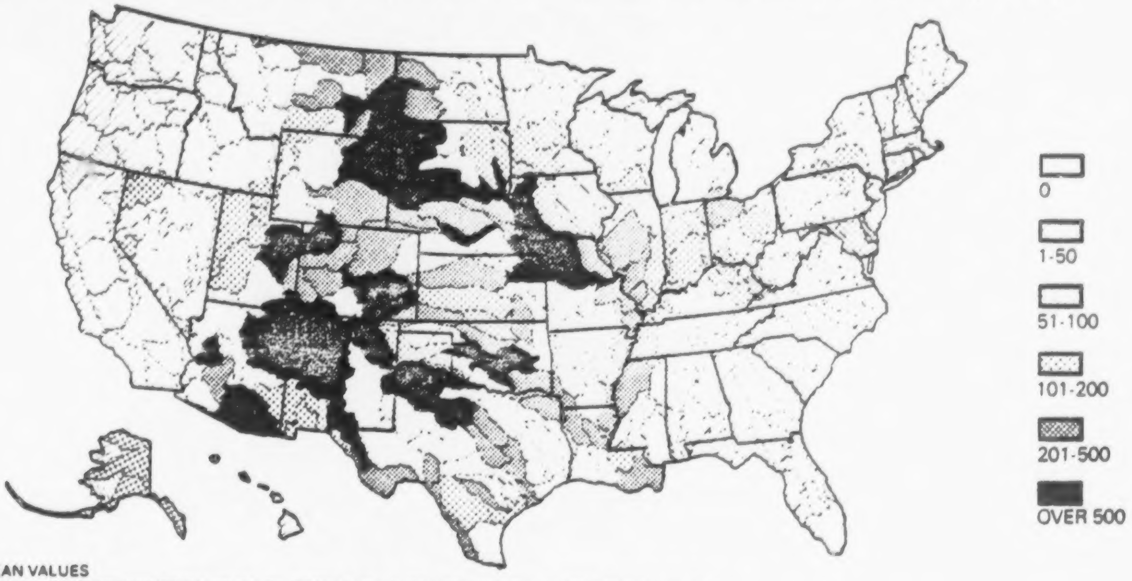
This loss of productivity has been remedied by the ever-increasing use of synthetic fertilizers and pesticides, but the true costs were masked by a huge subsidy from cheap oil. Now that oil is no longer cheap and this subsidy is removed, the farmer is caught in a bind. He can try to maintain productivity levels with the now high-priced fertilizers and pesticides, or he can cut back and run the risk of drastically reduced yields from his depleted land.

The costs of this soil erosion are as staggering as they are difficult to accurately determine. If we assume an average worth of $1,000 per acre of cropland, with six inches of good topsoil, the loss would amount to more than

Sediment, which is an end product of soil erosion, is by volume the greatest single pollutant in surface waters. It is also the principal carrier of other pollutants such as plant nutrients and chemicals which are attached to soil particles. Sediment levels are affected by natural conditions such as soil characteristics and climate, land use and intensity of use, and erosion control practices.

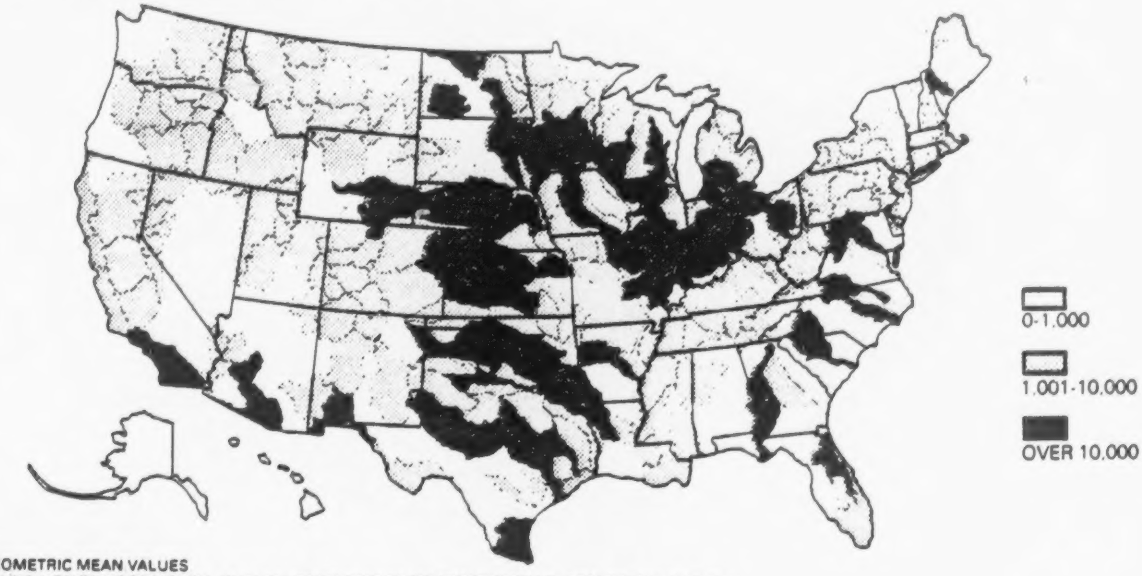
Algae and rooted plants are appearing in many bodies of water in response to nutrient enrichment from erosion, sewage disposal, and other sources. Too, there is a close pattern between high algae counts (over 10,000), the location of major agricultural areas, and phosphorus and nitrogen levels in streams.

SUSPENDED SEDIMENT CONCENTRATION, MILLIGRAMS PER LITER, 1976*



*ANNUAL MEAN VALUES
SOURCE: COUNCIL ON ENVIRONMENTAL QUALITY. FROM DATA SUPPLIED BY THE U.S. GEOLOGICAL SURVEY

ALGAE CELLS PER MILLILITER, 1976*



*ANNUAL GEOMETRIC MEAN VALUES
SOURCE: COUNCIL ON ENVIRONMENTAL QUALITY. FROM DATA SUPPLIED BY THE U.S. GEOLOGICAL SURVEY

Source: 1977 Handbook of Agricultural Charts
Agricultural Handbook No. 524, USDA, p. 28.

$6 billion worth of cropland each year.[17] If we figure what it would cost to replace this with soil purchased from the local nursery or landscaper (assuming the vast quantities required were available), the total comes to $54 billion annually.[18] This loss is doubly serious because it represents the destruction of an irreplaceable resource, and not just the loss of money.

Added to those figures must be the costs that this soil loss incurs in the form of deteriorated water quality and fish habitat and wetland management. Silt removal from United States waterways and drainage ways costs the United States more than $500 million per year.[19] Many expensive reservoirs are silting up so rapidly that they will last only half as long as originally intended.[20] The annual loss in capacity is valued at $2.87 billion.[21]

Sediment is the major pollutant -- in terms of quantity -- entering U.S. lakes, rivers and streams.[22] Sediment clogs waterways and reduces the efficiency of irrigation and drainage systems. Sedimentation can hinder cropland productivity by depositing coarse, infertile soils on top of productive bottomland soils.[23]

Development and Other Abuses

The frightening figures on soil erosion are not the end of the story, however. In addition to the land destroyed by erosion, we are losing cropland each year to salinity, acid rain, suburban sprawl, and other non-agricultural causes, such as building, paving and permanent flooding.[24] Every year 3 million acres of agricultural land are lost through development.[25] Of this land, about one million acres are prime farmland. This land is invaluable, because it is up to three times more productive than the new marginal land brought into agricultural use as a replacement.[26]

Together, erosion and development waste about 39 square miles of U.S. agricultural land every day.[27] This land could provide a minimum diet for nearly 400,000 people a year.[28] Given the extent of hunger and starvation in the world, this soil loss takes on enormous significance. In addition, the extra food it could produce would be worth about $2.6 billion to American farmers.[29]

Our soil is damaged further by compaction. The use of heavy machinery presses down the soil, making it less absorbent, and plant roots have difficulty taking up deep soil nutrients. As a result, more fertilizer is needed to maintain crop growth. In addition, as the soil gets harder, more energy is needed to plow it.

Continual, heavy use of herbicides and pesticides can destroy the living organisms which make up one to five percent of normal soil.[30] Repeated plowing does the same thing by increasing oxidation losses. The destruction of this organic matter reduces tilth, the ability of the soil to hold water and bind nutrients in forms that will resist leaching but are available to plants. Such "dead" earth is useful only for holding up plants, and any necessary nutrients must be added to the soil.

The search for new and old energy sources also adds to the stress on agricultural land. Growing crops to provide fuel on a commercial scale would require major changes in current agriculture. The USDA estimates that it would take about 300 million acres of corn to produce just 10 percent of the nation's current energy usage, about three times the acreage presently in corn production and 75 percent of the total cropland in use today.[31] The Office of Technology Assessment has estimated that producing enough gasohol to power most of the cars in the United States would require putting 30 to 70 million additional acres into intensive crop production.[32] That would accelerate erosion problems and contribute to other environmental damages.

Generating and transmitting electricity also require substantial amounts of land. New coal and nuclear power plants may take up 1.5 to 2 million acres of agricultural land.[33] Hydroelectric power plants commonly have reservoirs of 1,000 to 25,000 acres, which often cover valleys classified as prime farmland.[34] Transmission line rights-of-way currently occupy 4 million acres and will require 1.5 to 3 million additional acres by the year 2000.[35]

Surface mining for coal and other minerals had affected 5.7 million acres by 1977.[36] Surface mining currently disturbs an average of 400,000 acres per year, according to the Soil Conservation Service.[37] Although cropland used for surface mining is supposed to be restored to its former condition, there is some doubt that this is possible. Changes in the soil structure and excessive compaction may permanently impair productivity.[38]

Our response to this enormous problem has not been much better in its net effect than that of the ancient Mediterraneans, who bankrupted their once-rich soils into desert.[39] Our programs and policies to stop erosion are grossly inadequate, and some of the limited funds marked for soil conservation have been used for programs to increase crop yields.[40] Figure 1 helps illustrate the dismal prospects ahead if current erosion trends continue. (This figure is not a prediction, but a graphic picture of the limits of present ways. Something else, such as famine, would intervene long before the rising curve of soil depletion reached the absurd limit of 100 percent of the U.S. agricultural land.)

In 1937, Franklin Roosevelt remarked that "the nation that destroys its soil destroys itself." Current Agriculture Department Secretary, John R. Block echoed these sentiments in a recent discussion of what will happen if we continue to destroy our farmland: "We won't be talking critical problems; we'll be talking fatalities."[41] American soils are the most productive body of farmland on the face of the earth. But unless we start conserving this land, it will someday be gone, and our future with it.

5. Monoculture

In the spring of 1970, corn fields in Florida were struck with corn leaf blight. As the growing season progressed, the disease spread northward and westward through the corn belt. Many fields were destroyed almost completely.[1] When the epidemic finally ended, it had destroyed about 15 percent of our total corn crop -- some 700 million bushels.[2]

Scientists soon discovered that not all corn was susceptible to this blight. Only plants that carried what was known as Texas (T) cytoplasm -- cell material from a particular strain of corn -- were vulnerable. And for perhaps the first time, the general public became aware of the problems associated with crop monoculture, the growing of a single variety over a widespread area.

In an uncultivated state, a field or forest contains a great diversity of plants. When pests attack a particular species, the damage seldom spreads far, because the pest soon encounters a different variety. In addition, over the years many of the plants develop natural resistance to their enemies.

When man began to domesticate plants, this natural balance was upset. The goal of a farmer was always to find the best plants he could. Why grow corn that produced only one ear per plant when you could just as easily grow a variety that produced two or three ears? So as time passed, farmers naturally grew more of the better yielding crop varieties and discarded less productive types.

Indeed, the history of agriculture is a story of declining food variety. At least 500 major vegetable varieties were cultivated in ancient times. Today only 20 species are used in field cultivation. Ninety-five percent of our food now comes from no more than 30 plants.[3] Monoculture is a basic fact of modern agriculture.

In this century, plant geneticists have been very successful in breeding high-yield plants by combining the best traits of different varieties. In 1915, an average acre of corn yielded 25.9 bushels. In 1979, the average acre yielded 95.1 bushels. For wheat, the yield rose from 13.9 bushels per acre in 1915 to 31.4 bushels in 1979.[4]

To maintain these high crop yields, however, farmers have resorted to extensive use of chemical fertilizers and pesticides, and to increasing reliance on a few select varieties. In the United States today, the amount of genetic uniformity among major crops is frightening. Just two varieties of peas, for example, are planted on 96 percent of our acreage. Six varieties of corn are grown on 71 percent of our acreage.[5] The genetic base of our cultivated crops is so narrow that they are highly vulnerable to a new race of pathogen or a new biotype of insect pest.[6]

While breeding plants for high yields, scientists can also breed in resistance to specific insects and diseases. But many pests are extremely adaptable, and over time they may develop forms that can infect new varieties. The result can be an epidemic such as the corn blight of 1970. Scientists can then develop a variety with resistance to the new pest, but the process usually takes at least five years and sometimes as long as 20 years.[7]

With widespread monoculture, a sort of "pest cycle" often develops. Here's how it works, using the example of wheat rust. "(1) A variety of wheat is developed with good resistance to the locally prevailing races of rust; (2) the variety is grown on a large scale, partly because of its resistance; (3) a race of rust capable of attaching to the host evolves, increases rapidly, and causes an epidemic; (4) a gene for resistance to the new race is isolated and bred into a new variety; (5) the variety is grown on a large scale and the cycle starts over again."[8]

Monoculture has other negative effects on the soil and on farm economics. Continuous row cropping can cause serious erosion, and it requires heavy use of chemical fertilizers and pesticides to maintain good yields. With a single crop, the farmer is more vulnerable. If disease hits, or prices drop, he or she may lose heavily. Weeds tend to adapt and flourish. And identical growing seasons over wide areas make crops more susceptible to drought.[9]

To cope with these problems, plant scientists maintain seed banks, or germplasm collections, where different varieties are stored. Then, when a problem such as corn leaf blight arises, they find a variety with natural resistance and try to breed that characteristic into the next generation. For good results, however, these seed banks must be as diverse as possible, and properly maintained. And there must be sources in the wild for new and different plant varieties.

The U.S. Department of Agriculture maintains a National Seed Storage Laboratory at Fort Collins, Colorado, where more than 1,300 species of seed are stored.[10] But many scientists consider this collection inadequate. The stocks are maintained in cold storage, so they are not available for study and experimentation.[11] And current levels of funding for germplasm maintenance are inadequate for the work that needs to be done.[12]

In addition, natural centers of genetic diversity are disappearing. More wild land is coming under cultivation. Many plants are becoming extinct; estimates run as high as 1,000 species annually.[13] The dependence on monoculture is spreading across the globe. Already, the world's three main cereal crops -- wheat, corn (maize), and rice -- produce more in terms of dry edible matter than all other crops put together.[14] And with the so-called green revolution, Third World farmers abandoned locally adapted, diverse crops in favor of high-yield, uniform varieties. These varieties have increased food production, but at the same time they are "destroying the genetic variability which makes the success of such programs possible."[15]

There are signs, however, that the revolution may be winding down. Poor farmers are discovering that while their yields might be better, they are having other problems: poor storage life of crops, increased need for expensive fertilizers and pesticides, and required yearly seed purchases.* In many places, they are coming back to proven local varieties.[16]

Sadly, many gardeners are following the lead of farmers. In the past, gardeners often developed strains of vegetables and fruits that were particularly suited to their locality, and passed the seeds on to family and friends. But now, smitten by the desire for new varieties and better harvests, they are switching to a more limited number of high-yield types, and another valuable source of genetic diversity is being lost.

Seed companies also play a role in this trend toward monoculture. Many seed companies have been acquired by large corporations, such as ITT, Union Carbide, Upjohn, and Shell/Olin.[17] Control over seeds is becoming concentrated in the hands of companies whose primary interests are in such things as chemicals and energy.[18] Already, four companies -- Dekalb, Pioneer, Sandoz, and Ciba-Geigy -- control about two-thirds of all seed corn sales in the U.S. And these same four companies have 59 percent of the hybrid sorghum market.[19]

These large corporations are now pushing for broader seed patenting laws, arguing that in order to justify the money spent on research they must have exclusive rights to sell particular seeds. But these laws raise some dangerous possibilities. Seeds are the basic source of human food, and exclusive control by one company may infringe on the public right of choice. Seed companies, rather than consumers, may decide what kind of food we will eat, what its quality will be, and how it will be produced.

Additional patent laws would also put further financial pressure on smaller seed companies, who could not compete with their larger, better capitalized rivals in a restricted market. These smaller companies are good sources of unusual varieties, and their loss would accelerate the movement toward genetic uniformity. The President's Commission on World Hunger, as recently as March, 1980, said that food crop vulnerability "has been given a big boost by plant patenting laws."[20]

The recent history of the U.S. Plant Variety Protection Office is not encouraging. Forty-six percent of all the certificates they have issued (as of March, 1979) went to 17 large firms that have acquired once-independent seed companies. Of all the patents issued by that date, 72 percent were for just six crops.[21] Gardeners and farmers are not getting better yields for lower cost, as supporters of such legislation claim.[22]

Monoculture has clearly been a blessing in some ways. Without a certain amount of genetic uniformity, food production around the world would be lower, and hunger and starvation might be more widespread. But monoculture, if not carefully controlled, may turn out to be a bargain with the devil: those high yields come along with a high susceptibility to problems. And if the trend toward monoculture persists, the possibility for disaster increases.

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*High yield varieties are nearly always hybrids, which produce either useless or sterile seeds. So farmers can't save seed to plant another year, they must buy new seed.

6. Energy

With the exception of the solar energy used as an energy source by plants, the U.S. food system is powered almost entirely by fossil fuels. Because these fuels are becoming scarcer and more costly, and are subject to the vagaries of international political change or blackmail, that dependence is highly dangerous. A sustainable food system cannot be run on nonsustainable fuels.

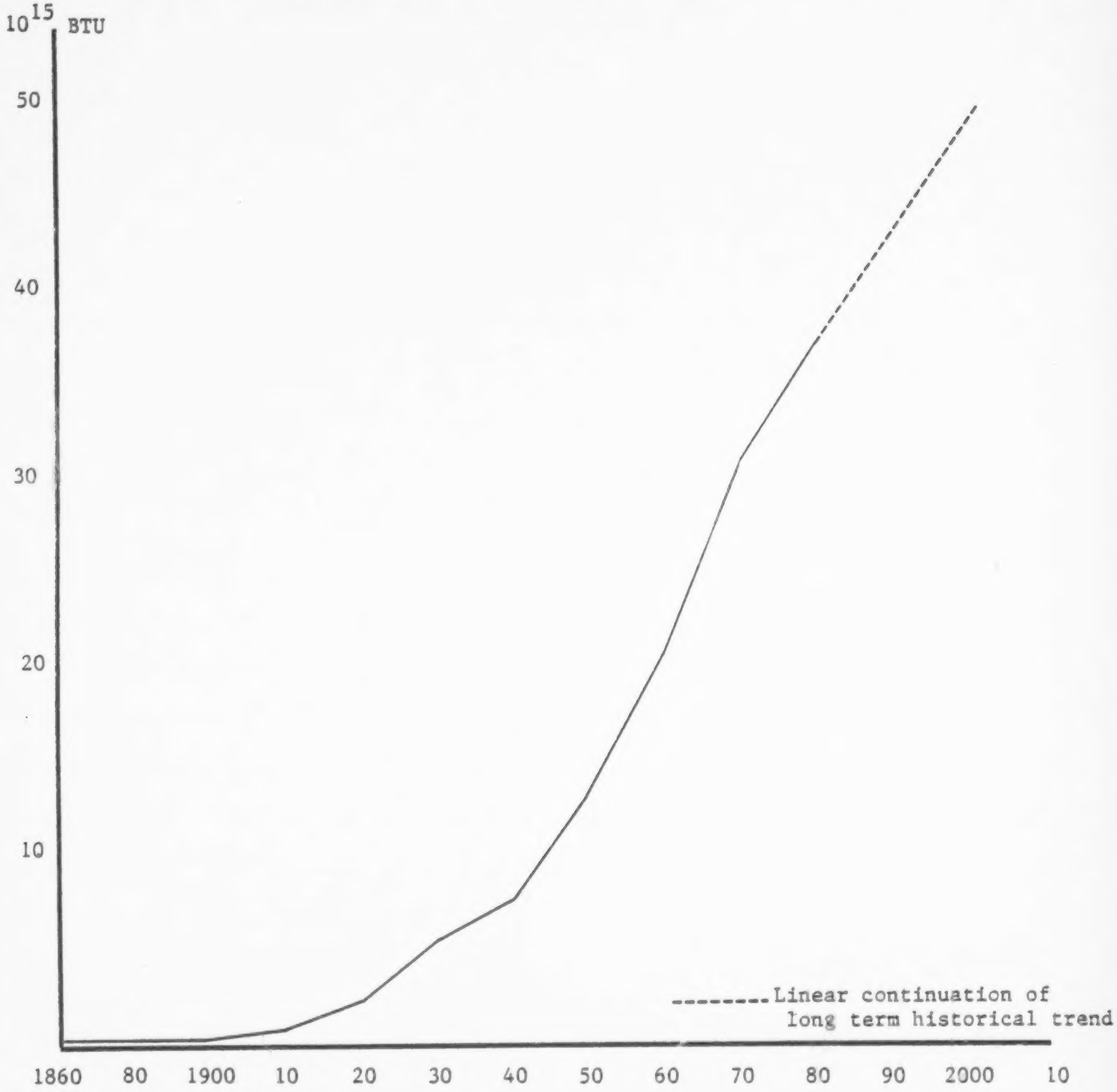
Domestic consumption of oil and natural gas has risen dramatically in recent years (see figures 1, 2, and 3), and these fuels could soon be priced beyond most people's ability to pay for them. At our current rates of consumption, proven U.S. oil and gas reserves would not carry us very far into the next century.[1] The United States currently imports about 40 percent of its fuel.[2]

The U.S. food system does very poorly in terms of energy-use-per-food-calorie output. It takes more energy to produce a calorie of food in the United States than it does almost anywhere else. On the average, our system burns 6.4 units of commercial energy for each unit of food energy that reaches our plates.[3] Some foods take considerably more; processed vegetables, for example, consume nearly 16 units of energy for every unit of food energy produced.[4] To feed the world with a U.S.-type food system would take up to 60 percent of the total amount of commercial energy in use globally,[5] and such a system would burn up all of Earth's known petroleum reserves in 13 years.[6]

The U.S. food system consumes about 16.5 percent of the total energy used in the country (see figure 4), and this energy cost consumers more than $36 billion in 1975.[7] Over 50 percent of the food system energy comes from oil, and at least a quarter of this amount is imported oil.[8] And although only three percent of total U.S. energy consumption is devoted to agricultural

FIGURE 1

YEARLY PETROLEUM CONSUMPTION, U.S.



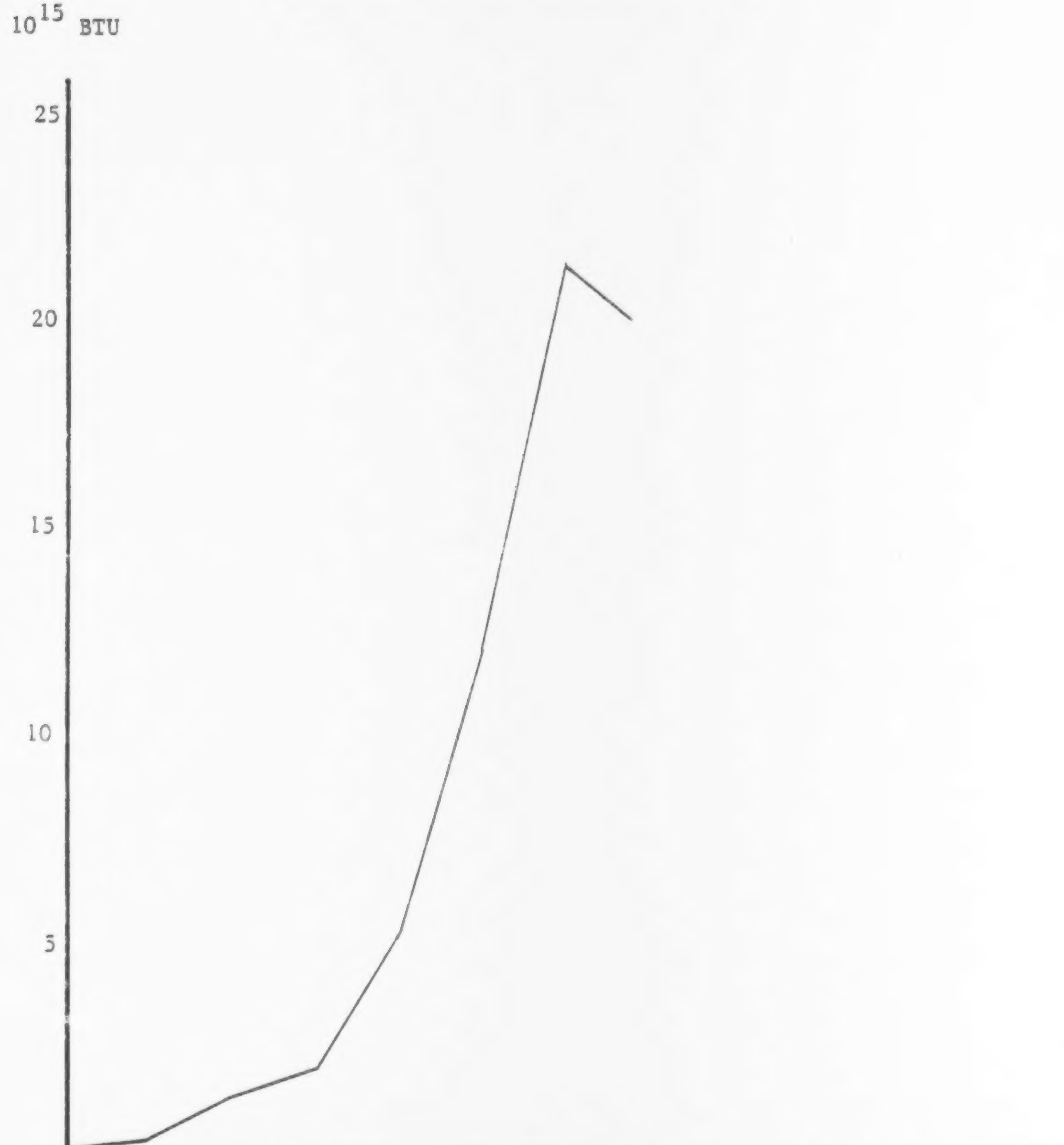
Sources: U.S., Department of Commerce, Bureau of the Census, Historical Statistics of the United States, Colonial Times to 1970, Part 1, p. 588. Washington, D.C.: U.S., Government Printing Office.

Congressional Research Service, Energy Information Digest, Basic Data on Energy Resources, Reserves, Production, Consumption, and Prices, July 1977, p. 34. Washington, D.C., Government Printing Office.

1980 data from National Energy Information Center.

FIGURE 2

YEARLY NATURAL GAS CONSUMPTION, U. S.



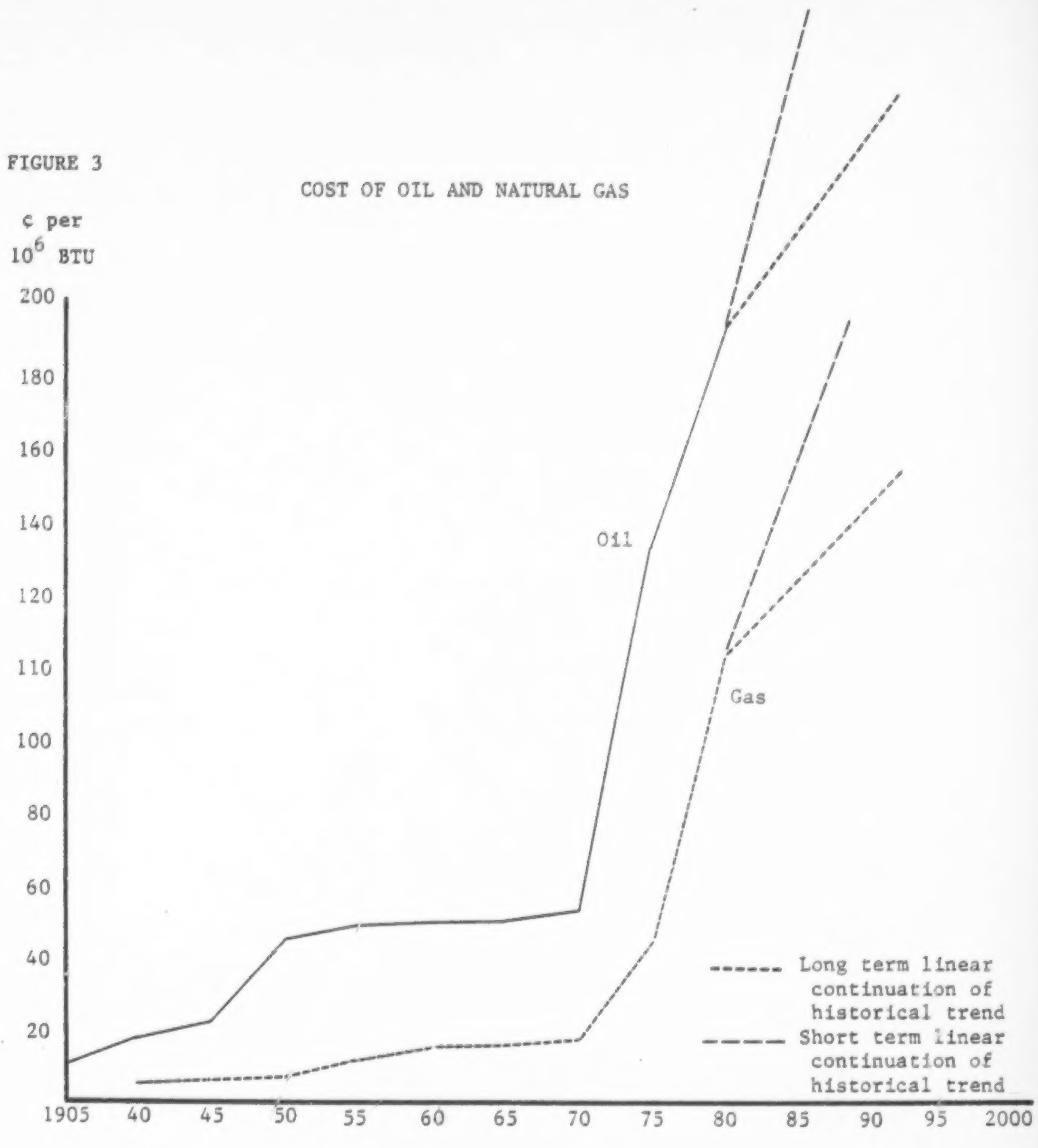
Sources: U.S., Department of Commerce, Bureau of the Census, Historical Statistics of the United States, Colonial Times to 1970, Part 1, p. 595. Washington, D.C.: U.S. Government Printing Office

Congressional Research Service, Energy Information Digest, Basic Data on Energy Resources, Reserves, Production, Consumption, and Prices, July 1977, p. 33. Washington, D.C.: U.S. Government Printing Office.

U.S., Department of Energy, Monthly Energy Review, September 1981, Energy Information Administration, p. 52.

FIGURE 3

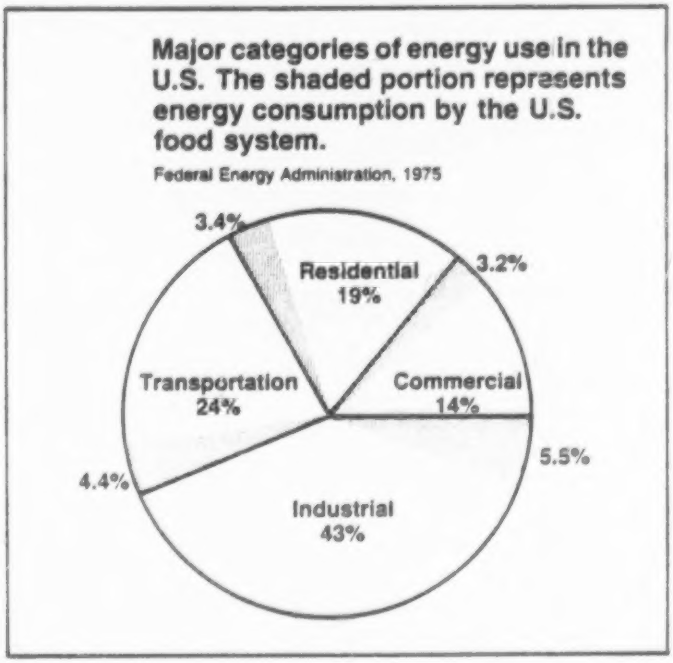
COST OF OIL AND NATURAL GAS



Sources: U.S., Department of Commerce, Bureau of the Census, Statistical Abstract of the United States 1980, p. 607. Washington, D.C. Government Printing Office.

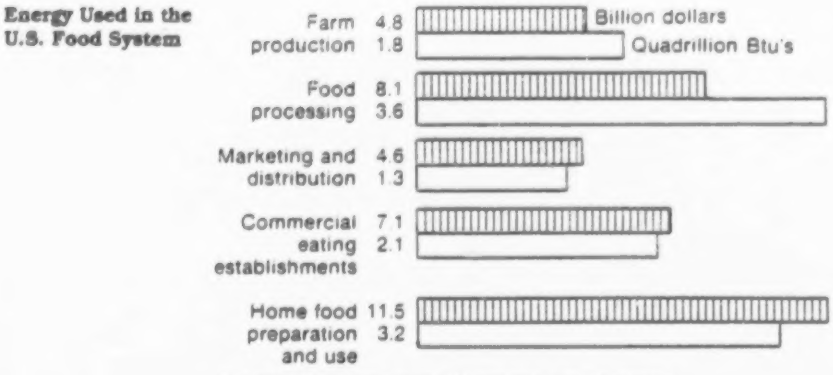
U.S. , Department of Commerce, Bureau of the Census, Historical Statistics of the United States, Colonial Times to 1970, Part 1, pp. 593-5. Washington D.C.: U.S. Government Printing Office.

FIGURE 4


Major categories of energy use in the U.S. The shaded portion represents energy consumption by the U.S. food system.

Federal Energy Administration, 1975

Source: Energy and You, Special Circular 246, The Pennsylvania State University, College of Agriculture Extension Service, University Park, Pennsylvania.


Energy Used in the U.S. Food System

1976 data for farm production 1975 data for all other categories.

1979 *Handbook of Agricultural Charts* Agricultural Handbook 561 USDA

Source: Cutting Energy Costs The 1980 Yearbook of Agriculture U.S. Government Printing Office, 1980, p. 11.

production,[9] a huge share of this energy -- 93 percent -- is derived from petroleum.[10]

Farming uses more petroleum than any other single industry. General crop farms use over $4.00 worth of petroleum products per acre, while U.S. vegetable farms use over $12.00 worth per acre.[11] By making the United States' "supply of food -- its single most critical need -- dependent on the continued smooth functioning of a complex distribution system that is vulnerable to energy related disruptions"[11] the entire system is endangered.

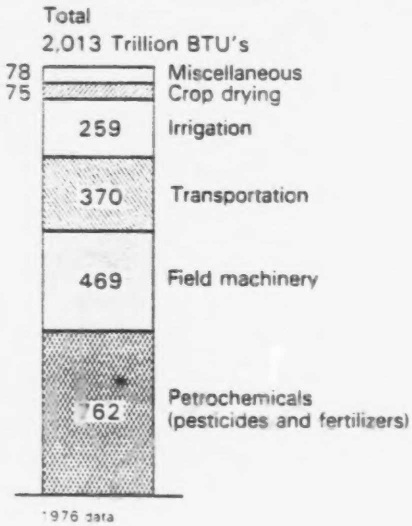
The potential for trouble is illustrated by a recent Department of Energy study, which found that an energy shortage or reduction of 10 percent would lead to an increase of 55 percent in raw commodity prices.[12] If this reduction were applied to all areas of food production and marketing as well, increases in retail food prices would be even greater.[13] Similarly, slight oil cutbacks or interruption of supplies at a crucial time in the agricultural cycle, such as planting or harvesting, could have a devastating impact on food production capacity.

Despite this vulnerability, the total amount of energy being used by the U.S. food system is increasing at an alarming rate (see figures 5, 6). If this trend continues, the food system will soon outstrip the energy system's ability to supply it. Further, as the food system uses more energy, less is available for the rest of the economy, and the more inflated our food costs become.

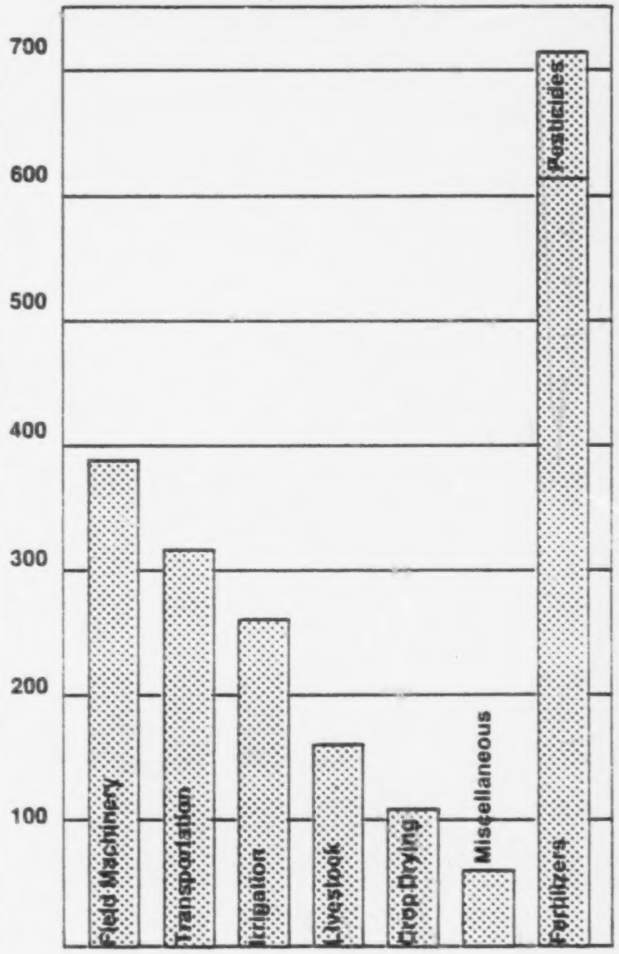
This increasing energy use is primarily off the farm, and much of it goes for processing and long-distance transport of food. At the present time, the processing and packaging of food in this country use as much energy as all the farms that produce our food. And for every $2 we spend on energy to grow food, we spend another $1 moving it around.[14]

FIGURE 5

Energy Used in Agricultural Production



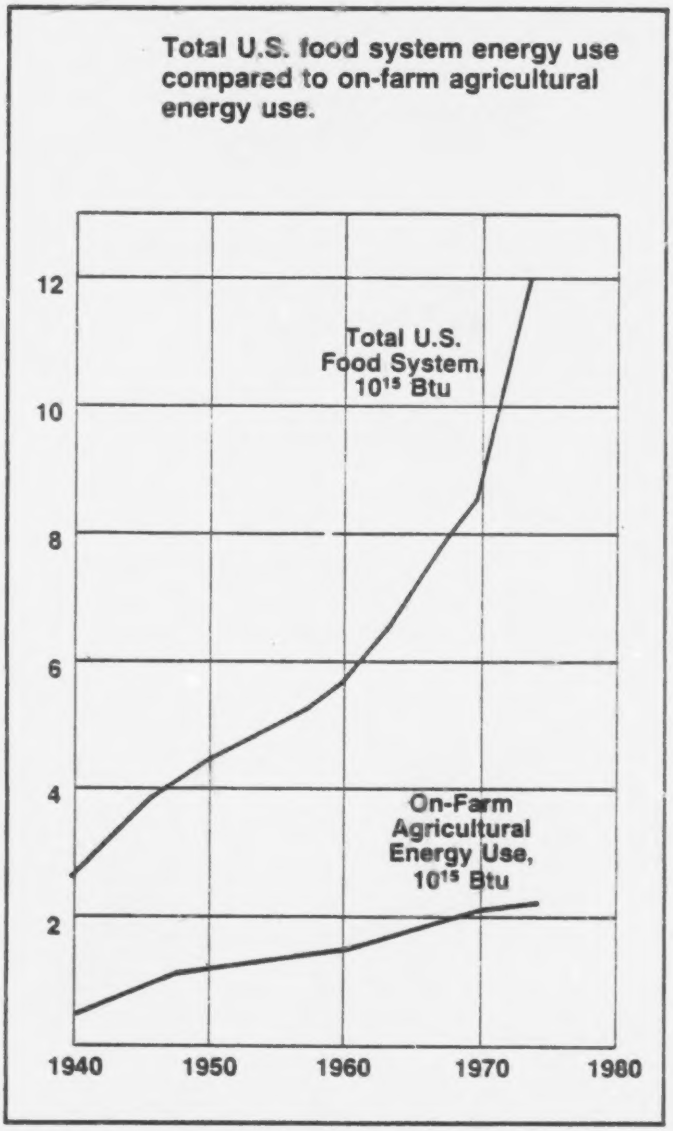
Energy used in production agriculture.



	Trillion Btu	
Field Machinery Till, plant, cultivate, applications,harvest	391	30%
Transportation Pickups, on-farm hauling, business auto trips	317	25%
Irrigation	261	20%
Livestock, Dairy, Poultry	161	12%
Crop Drying	107	8%
Miscellaneous	61	5%
Total Fuel and Electricity	1,298	100%
Indirect Energy: manufacture of fertilizers and pesticides	716	
Total	2,014	

Source: Energy and You, Special Circular 246, The Pennsylvania State University, College of Agriculture Extension Service, University Park, Pennsylvania

FIGURE 6



Source: Energy and You, Special Circular 246, The Pennsylvania State University, College of Agriculture Extension Service, University Park, Pennsylvania.

Each year, shipping fresh produce around the United States uses about 475 million gallons of fuel.[15] In August, 1981, it cost $1.12 for every mile that a large truck moved fruits and vegetables -- up almost 11 percent since August, 1980.[16] A truckload of broccoli pulling into New York City from California, for example, would cost $2,000 more than the same truckload coming from nearby New Jersey.[17]

Moving food around not only costs money, it raises the specter of food shortages. In recent testimony before Congress, a spokesman for the Food Marketing Institute urged that food distributors be given the same fuel priority during an energy crisis that farmers have. The spokesman reported that during the 1979 fuel shortage, some distributors "came within a day or two of not having enough fuel to deliver food. In other words, we were only days away from shortages on the shelves of grocery stores around the nation."[18]

Synthetic fuels, derived from coal and shale, are sometimes put forward as an alternative to petroleum. But under present economic conditions, these fuels cost 2 to 4 times as much as naturally occurring liquid fuels.[19] Oil shale processing is also very costly in terms of resources, using approximately 39 gallons of water per barrel of shale oil. (All the oil shale deposits are located in the water-short states of Colorado, Utah and Wyoming.[20]) And finally, both shale and coal technologies result in huge amounts of potentially destructive and hazardous chemical wastes.

The energy on which the U.S. food system depends is caught in a frightening cycle. Prices are rising, demand is increasing, the supply is decreasing, and our suppliers are unreliable. Until we lessen our reliance on non-renewable energy sources, the food supply for much of the country will be dangerously vulnerable.

7. Mineral Base

Conventional farming in the United States is almost totally dependent on chemical fertilizers, particularly those that supply the three essential plant nutrients -- phosphorus, nitrogen and potassium. About 96 percent of the corn, 62 percent of the wheat, 77 percent of the cotton, 31 percent of the soybeans and nearly 100 percent of the vegetables produced in this country are fertilized.[1]

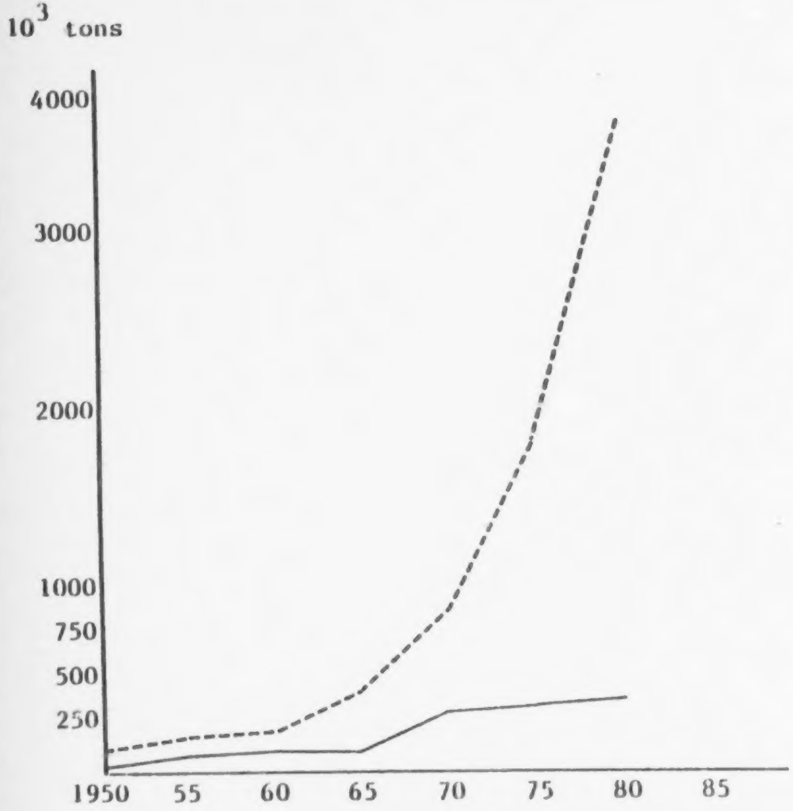
In 1980, U.S. farmers used 5.39 million tons of phosphorus, 11.4 million tons of nitrogen, and 6.16 million tons of potassium.[2] We now apply an average of 111 pounds of synthetic fertilizer nutrients per acre of cropland each year, which amounts to 210 pounds for every person in the country.[3] Without this fertilizer, yields would drop an estimated 50 percent.[4]

But there are supply problems with each of these minerals. Phosphate imports for 1979-1980 were up 23 percent over the 1977-1978 level, while imports of anhydrous ammonia (nitrogen fertilizer) jumped 76 percent in the same period. Only 24 percent of our net supply of potash (potassium fertilizer) for 1979-1980 was from domestic sources.[5]

Phosphorus is particularly vulnerable. The United States is currently the world's leading producer of phosphate rock,[6] the only commercial source of phosphorus. In 1977-1978, the U.S. produced 25 percent of the world's phosphate fertilizer.[7] Our richest deposits are in the Bone Valley of central Florida, and these deposits account for about 75 percent of U.S. production.[8]

Phosphate use has doubled since 1960.[9] The increasing demand for this fertilizer has put a severe strain on our limited resources. U.S. production of phosphate rock is expected to peak about 1985, and to decline over the next two decades. Shortly after the year 2000, our commercially accessible

PHOSPHATE IMPORTS AND EXPORTS

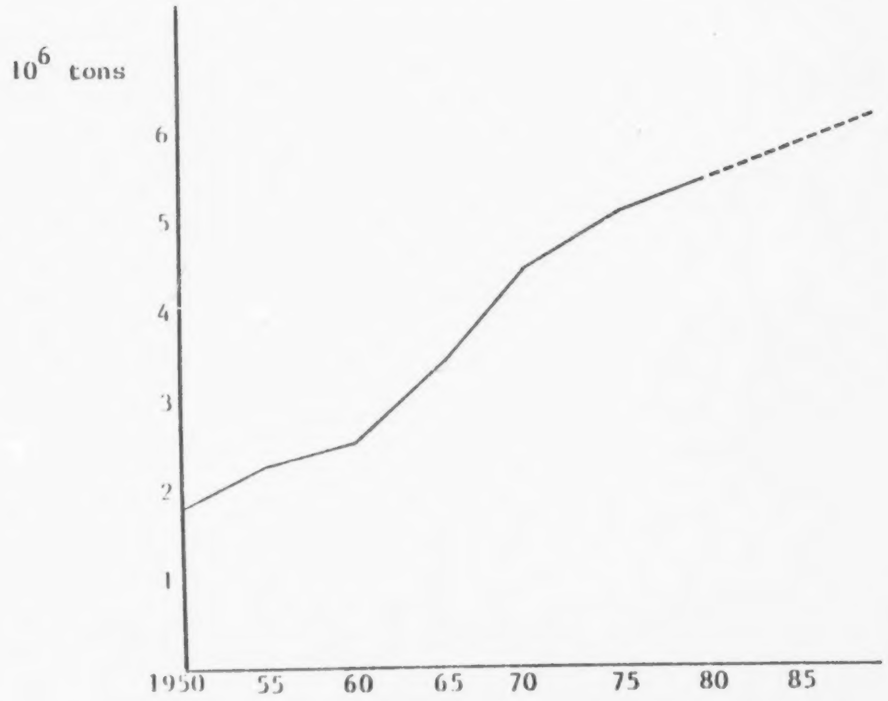


Source: The Fertilizer Supply, Nitrogen Phosphate Potash 1979-80, USDA, Agricultural Stabilization and Conservation Service, Washington, D.C., April 1980, p. 16.

----------- Exports

__________ Imports

PHOSPHATE CONSUMPTION



Sources: L. A. Prior, Land Availability, Crop Production, and Fertilizer Requirements in the U.S., October 1975, p. 17.

U.S., Department of Agriculture, Agricultural Statistics 1980, United States Government Printing Office, Washington, D.C., p. 467.

-----------Long term historical trend

reserves may be exhausted.[10] When our own deposits are gone, we will have to obtain phosphorus from abroad.

Despite our rapidly dwindling stores, the United States is still one of the world's leading exporters of phosphate rock. In 1980-81, 42 percent of our production was sold overseas.[11] And recently, a major U.S. producer signed a deal to send the Soviet Union 2.8 million metric tons of phosphate per year for 20 years.[12]

The results of this situation -- a rapidly depleting phosphate supply, increasing demand, substantial exports -- could be disastrous. Given current trends, by the end of this century, the United States will almost certainly be dependent upon other countries for phosphate rock.

> It seems entirely possible that by 1990 Morocco and various Middle Eastern countries (Jordan, Egypt, Saudi Arabia) will supply 75 percent of the world trade in phosphate rock. If this were to happen, a cartel could easily be formed to control phosphate prices.[13]

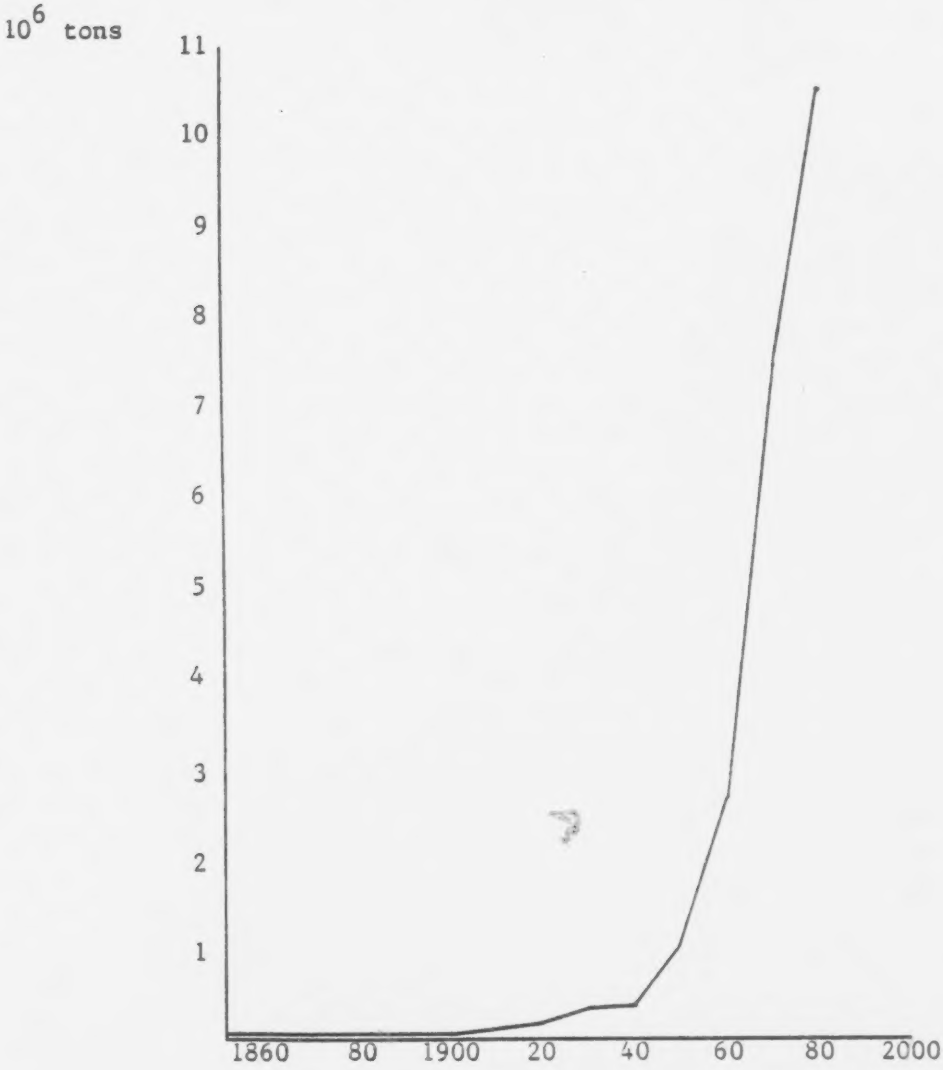
Such an action would put us in the same position with phosphate rock as we are in with oil: unable to survive without massive imports, and forced to pay whatever price the cartel asks.

Nitrogen presents another problem. There is no danger that we will run out of nitrogen; it makes up about 78 percent of our air. Most plants cannot use nitrogen in this "free" form, however. To be available to them it must be "fixed," or combined with another element. The most common way to fix nitrogen for fertilizer is to combine it with hydrogen to make ammonia. And the most widely used source of hydrogen is natural gas -- which is in short supply and getting more and more expensive.

Natural gas is used almost exclusively in the production of ammonia because it is a relatively clean, low-carbon fuel. To make one ton of ammonia requires about 38,000 cubic feet of natural gas,[14] enough to heat the

U.S. Nitrogen Fertilizer Consumption

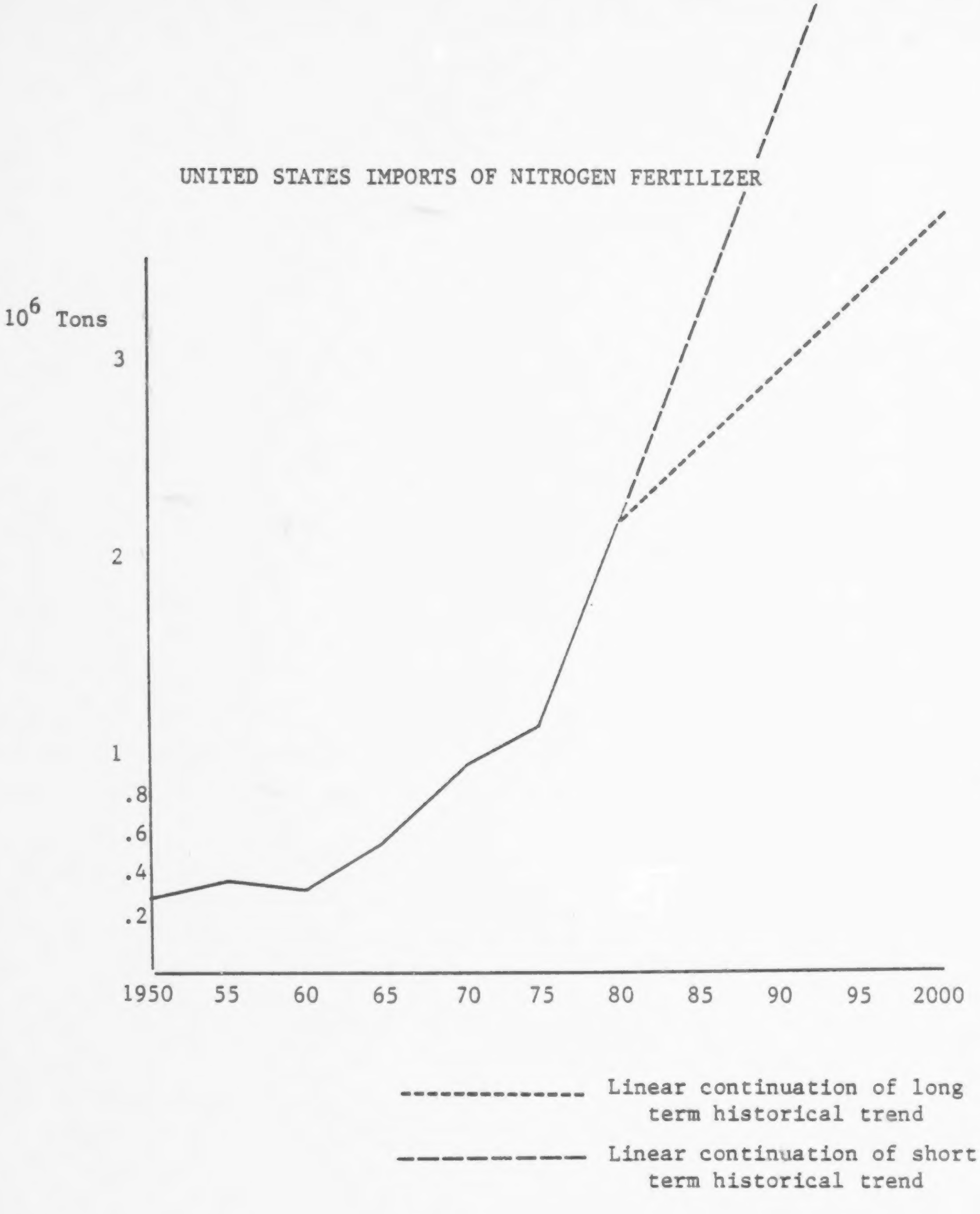
Primary Nutrient Content



Sources: U.S., Department of Agriculture, Consumption of Commercial Fertilizers, Primary Plant Nutrients, and Micronutrients, Statistical Reporting Service, Crop Reporting Board, Statistical Bulletin #472, Washington, D.C., Government Printing Office, 1966, pp. 2, 3.

U.S., Department of Agriculture, Commercial Fertilizers Consumption by Class of Year Ended June 30, 1979, Crop Reporting Board, Economics, Statistics and Cooperative Service, December 1979, P. 14.

UNITED STATES IMPORTS OF NITROGEN FERTILIZER



Source: U.S., Department of Agriculture, The Fertilizer Supply: Nitrogen, Phosphate, Potash 1979-80, April, 1980, p. 16. Agricultural Stabilization and Conservation Service, Washington, D.C.

average U.S. house for nearly four months.[15] The manufacture of ammonia fertilizer uses about two percent of U.S. production and five percent of world production of natural gas,[16] and chemical fertilizer represents the single largest energy drain on the U.S. farming system.[17] (See Figure 7.) More energy is used to produce synthetic fertilizer than is used in tilling, planting, cultivating, and harvesting all the crops in the United States.[18]

While we won't run out of nitrogen, we are running out of natural gas. And when our gas supplies are exhausted, we will either have to import ammonia or make it with other, even more expensive methods: synthetic gas produced from coal[19] or hydrogen produced by the electrolysis of water. The cost of ammonia has already risen rapidly along with natural gas prices, and this rise has led to increased imports of ammonia from countries with cheap, accessible supplies of gas. After nine years of self-sufficiency, the United States became a net importer of ammonia in 1974, and since then imports have approximately equalled exports.[20] In 1979-80, the United States imported about 19 percent of its nitrogen fertilizer, at a cost of over $470 million.[21]

Potassium, the third critical fertilizer element, is made primarily from potash, or potassium oxide. Primary U.S. deposits are in New Mexico, Utah and California, while the largest world reserves are in the Soviet Union and Canada, particularly Saskatchewan. Until 1962, the United States supplied all its own potash needs. In 1979-1980, we produced less than one quarter of the amount we used;[41] nearly 76 percent came from Canada.[22] Potash imports cost the United States $399 million in 1978.[23]

Projections are that the U.S. consumption of potash will double by the year 2000, at which time we will produce less than 10 percent of our total needs.[24] This means we will once again be completely dependent on another country -- albeit a friendly one -- for an essential element.

Processing potash also has undesirable aspects. It is highly energy intensive -- nearly 1,500 kwh of electricity are required to make each ton of potassium fertilizer.[25] The mineral by-products of the process are water soluble, and can cause contamination, while the dust is an air pollutant and has shown negative effects on vegetation surrounding manufacturing plants.[26]

The continued well-being of the U.S. food system depends on the availability of phosphorus, nitrogen and potassium. Yet the future sources of these vital minerals pose serious difficulties for the United States. Without an abundant, reasonably-priced supply, our productivity will be drastically reduced.

8. Environmental Impacts

The increasing use of herbicides, pesticides, and chemical fertilizers has led to the contamination of our soil and water, the destruction of wildlife and increased health problems for farm workers. America's farmers currently use about two pounds of pesticide[1] and 111 pounds of synthetic fertilizer nutrients per acre of cropland.[2]

The use of chemical fertilizers and pesticides is an integral part of conventional farming. These substances are applied before planting to "give crops a good start"; they are applied during the growing season to "ensure high yields"; they are applied after the harvest to "preserve quality during storage and shipping".

Because some of the compounds in these chemicals are novel to the biosphere, they are metabolized slowly or not at all, and tend to accumulate and to concentrate up the food chain. Nearly everyone in the United States consumes small amounts of pesticides daily in food and water, and the average person has a pesticide residue in the fatty tissue of six parts per million. About half of all U.S. food tested contains detectable levels of pesticides.[3]

Chemical fertilizers and pesticides pollute water in three ways: they wash off crops and fields into surface water; they seep into groundwater; and they are blown into streams, rivers, and lakes. These chemicals not only taint our drinking water, they harm fish, waterfowl, and other wildlife.

Air quality is also threatened by agricultural chemicals. Pesticides carried by the wind can harm crops and useful insect populations many miles from their points of application. Fluoride emissions from the phosphate fertilizer industry injure plants and contribute to chronic fluorosis in cattle.[4] Nitrogen fertilizers are suspected of releasing a catalytic form of nitrous oxide that may contribute to the depletion of the ozone layer.[5]

As a final insult, these chemicals -- especially pesticides -- endanger human health. The United Nations estimates that half a million people throughout the world are poisoned by pesticides every year,[6] about 45,000 of them in the United States.[7] Farmers, despite being able to work in the fresh air and eat plenty of homegrown foods, have been shown to be at higher risk than others of contracting diseases of the respiratory and central nervous systems.[8] Pesticides have been linked to such problems as blood dyscrasias, allergy sensitivities, neurological alterations, hypertension, high blood cholesterol, cardiovascular disease and liver disease. In developing countries, a resurgence of malaria has been attributed to the intensive agricultural practices of the green revolution, which have led to a pesticide resistant mosquito.[9]

The indirect cost of agricultural chemicals is substantial. One study suggested a figure of more than $839 million: $184 million for human health; $12 million for livestock and product losses; $287 million for increased pest resistance and harm to natural pest enemies; $135 million for bee poisonings and reduced pollination; $70 million for crop and tree losses; $11 million for fish and wildlife losses; and $140 million for state and federal pesticide pollution control.[10] And this does not include such things as damage to soil, long-term health effects, and the costs of cleaning up toxic pesticide dumps.

In light of these problems, it is ironic that pesticides are not doing their job very well. In the past 15 years, pesticide use has increased 140 percent.[11] During the same period, however, crop loss to insects increased over 40 percent.[12]

The problem is that pests can develop a resistance to chemicals, which leads to the use of more and/or stronger pesticides. The cycle then repeats itself until we reach the absurd point where we are today: despite massive use of pesticides, crop losses continue to increase. To poison pests, we are slowly poisoning ourselves and our environment. Unless we can break this nonsustainable pattern, the environment may soon be unable to support the continued production of food.

9. Water

A regular supply of water is essential for the survival of plants, animals, and people. Although less than one percent of the world's total supply of water is fresh and available for use, this should be more than enough to meet our needs.[1] Rain and melting snow provide an average of 3,000 gallons a day for every man, woman, and child in the United States.[2] As individuals, we each require less than a gallon a day to meet our essential biological needs. But our other needs place additional demands on this water, and we waste large amounts.

One of the problems is distribution. Water, like food, is not always located where it is needed. Some areas of the U.S. are facing serious water shortages, and highly productive cropland is already being lost. Other areas are threatened with water quality problems, such as salinity and organic pollutants. But so far, little has been done to deal with these growing problems.

Irrigation

The Western United States receives about 27 percent of our annual rainfall, yet it consumes* 84 percent of our national water total. Westerners, per capita, use 14.7 times as much water as people in the East.[3] The primary reason is irrigation, which takes 81 percent of all the water consumed in this country.[4] There is much fertile land in the West, but low rainfall, so irrigation is essential for most types of farming. Originally, the surface water used for irrigation was free, and users got water rights for as long as the water was used beneficially.

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*Water usage is measured in two ways: water withdrawn and water consumed. Withdrawals are usages that return a considerable portion of the water to streams, rivers, or ground water sources where it is available for re-use. Consumption represents water that is primarily incorporated into a process or product and is not reused.

Today, only about 15 percent of the cultivated cropland in the U.S. is irrigated. But these 55 million acres are vital to our food system: they produce more than 25 percent of the total value of U.S. crops. And the great majority of this irrigated land -- 83 percent -- is in the West.[5]

While irrigation is necessary in many areas, it is extremely wasteful. With current practices, less than half the water delivered for irrigation is consumed by crops.[6] The rest is lost to such things as seepage, evaporation, or overwatering. Water-conserving methods of irrigation have been developed and are used in other countries, but these methods have not been widely adopted here.

Initially, only surface water was used for irrigation. But in the 1930's, new pumping methods and cheap energy made it possible to use groundwater. At first this was used primarily as a supplement in dry years, but as irrigated land increased, it became an essential water source. Groundwater irrigation rose from about 11 million acre-feet* in 1945 to over 56 million acre-feet in 1975.[7] Current estimates are that more than half the irrigation water now comes from groundwater sources.[8]

Most of the groundwater in the U.S. has accumulated over centuries in huge underground reservoirs called aquifers. While this water is theoretically replaceable, the spread of irrigation has meant that in many areas groundwater is being used at a rate exceeding replenishable levels. This "mining" of groundwater has now reached major proportions -- an estimated 25 percent of our

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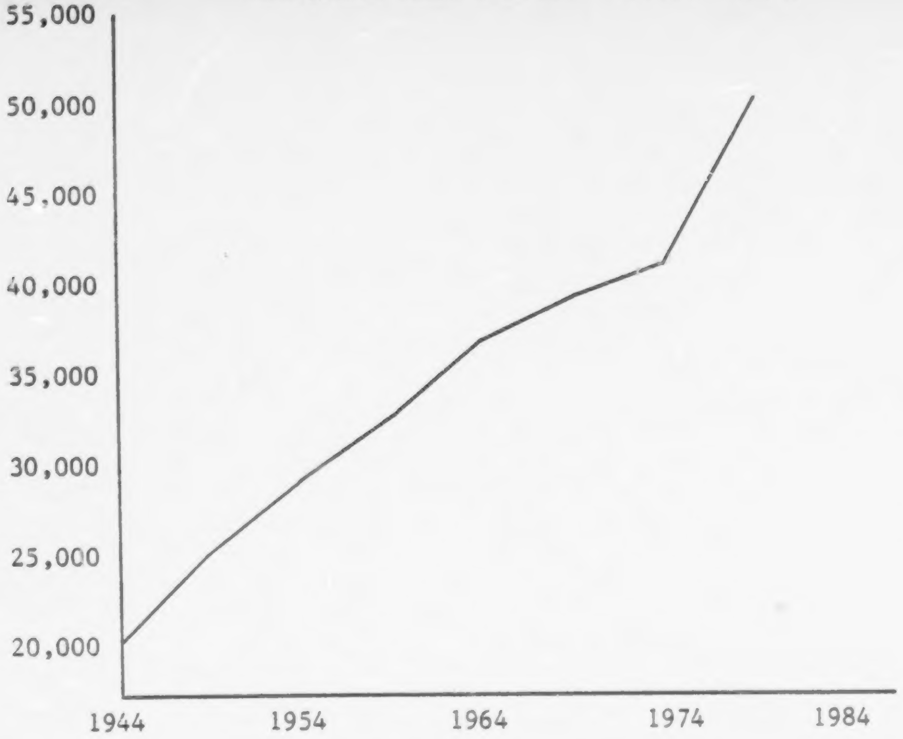
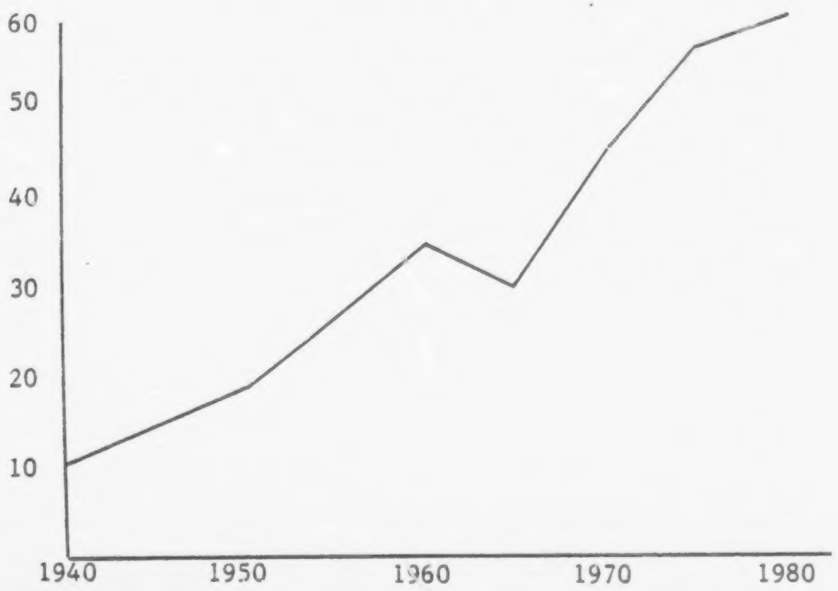
*An acre-foot is the measurement used for irrigation water, and equals 12 inches of rain over an acre of ground. One acre-foot amounts to 43,560 cubic feet of water, more than 325,851 gallons or almost 1,358 tons.


Irrigated Land in U.S. (1,000 acres)

Sources: U.S., Department of Agriculture, Agricultural Statistics 1980, (Washington, D.C.: Government Printing Office, 1980), p. 421.

U.S., Department of Commerce, 1978 Census of Agriculture, Vol. 1, Summary and State Data, Part 51, United States, Bureau of the Census July, 1981, p. 9. Washington, D.C.: U.S. Government Printing Office.


Use of Groundwater in Irrigation (billion gallons daily)*

*1940-1960 not strictly comparable to later years due to differences in estimation procedures

Source: U.S., Department of Commerce, Statistical Abstract of the United States 1980, Bureau of the Census, (Washington, D.C. Government Printing Office, 1980), p. 213.

groundwater use is overdrafts.[9] In an average year, 21 billion gallons of water are mined from our groundwater every day.[10]

These large overdrafts of groundwater for irrigation will not, in the short term, deplete our supplies totally. But as water tables fall, and energy prices rise, it becomes more and more expensive to pump groundwater for irrigation. At some point, it costs too much to farm economically, and the land is abandoned.

The worst problems are in the high plains region of Texas, Oklahoma, New Mexico, and Kansas, and in Arizona -- areas that contain 20 percent of the West's irrigated land[11] and produced agricultural products worth more than $17 billion in 1978.[11a] Fields here are watered almost exclusively with groundwater. In an average year, less than one-quarter of the groundwater that is used is replaced in five subregions of the Arkansas, Texas and Colorado areas.[12] Sometime in the next 30 years, water withdrawals in these areas will become impractical,[13] and there is no other source of water currently available.

This has already happened in scattered areas. Since 1960, Pinal County, Arizona, has lost nearly 100,000 acres of farmland -- more than one-third of the irrigated land in the area.[14] Ten years ago, the area around Pecos, Texas was prime cotton land, with 15 gins and a thousand farmers. In 1973, a leap in natural gas prices made water pumping too expensive, and most of these fields now grow only tumbleweeds.[15] In the next two decades, many other areas can expect similar cropland losses.

Excessive mining of groundwater can also cause subsidence, or sinking of the land surface. As water tables are lowered, the ground compacts and sinks. According to the U.S. Geological Survey, significant subsidence has occurred in Louisiana, Texas, Arizona, New Mexico, and California.[16] In California's

San Joaquin Valley, where farmers mine nearly 1.5 million acre-feet (489 billion gallons) of groundwater yearly,[17] the land has sunk as much as 29 feet over the last 50 years.[18] In Central Arizona, subsidence as much as seven feet has occurred since irrigation began.[19]

Overuse of groundwater has other environmental consequences. By reducing the base flow of streams and springs, it has adverse affects on fish and wildlife habitats, especially during dry periods.[20] In coastal regions, it leads to the underground intrusion of salt water.

Some areas of the West are also facing shortages of surface waters, despite intensive management of rivers and lakes. The Colorado River is a prime example. It rises in the Rockies, and passes through seven Western states and part of Mexico before emptying into the Gulf of California. Use of its water was the subject of the longest oral argument in the history of the U.S. Supreme Court, and the 1963 ruling that finally settled the dispute allocated more water than flows in the Colorado.

So far this has not been a problem, since all the states haven't drawn their full share. But the crunch may come in 1985, when the $1.7 billion Central Arizona project will be completed, and divert 390 billion gallons yearly to the Phoenix and Tucson areas.[21] California currently uses more than its share, drawing on Arizona's unused portion. Much of that water travels by canal to the Imperial Valley, irrigating over three million acres of fruit and vegetables worth $1 billion annually.[22] When Arizona starts to use all its water allocation, California will either have to pipe water from the northern part of the state or face the loss of these lucrative croplands.

Irrigation also causes water quality problems, particularly salinity. All waters carry salts, and when irrigation water evaporates, the salts condense and collect in the soil. If the salt content gets too high, it can stunt the growth of plants.

Where soil has good drainage, the salts wash away. But they are either washed into surface or groundwater sources, raising the salt levels there. Already every Western river basin (except the Columbia River Basin) has a high salt level that is rising regularly.[23] An estimated 25 to 35 percent of irrigated land in the West has some kind of salinity problem.[24] Annual damages from salinity in the Colorado River are expected to range from $75 to $104 million in 1980 and up to $160 million per year in 2000 if nothing is done to correct this situation.[25]

If the land does not have good drainage, continued irrigation raises groundwater levels. The ground becomes waterlogged, and as the water evaporates from the surface it leaves salt residues behind. Over a period of time, this diminishes and then destroys the soil's usefulness. In the San Joaquin Valley, farms are being hurt by salt build-up from irrigation. On some croplands, yields are down 10 to 35 percent, resulting in income losses of at least $32 million yearly.[26] This process has ruined five million acres of rich farmland on the floodplain of the Indus River in Pakistan.[27]

Finally, there is the problem of water pollution from the run-off of chemical fertilizers, pesticides, and insecticides. (See "Environmental Impacts.") The environmental impact of these substances costs an estimated $839 million annually.[28]

In the years ahead, the demand for water by industry, energy producers, and residential users will increase rapidly, and these groups will compete fiercely with agricultural interests for available water. Meanwhile, federal and state water laws and policies are generally ill-designed and uncoordinated, and conservation programs are seriously inadequate.*

Drinking Water

For the last 50 years or so, Americans have taken it for granted that when they turned on the tap, pure water would flow out. But those days are gone. Much of the water we drink is seriously polluted, even in the water-rich East.

The primary reason for our growing water pollution problem is the rapid increase in the production of waste. The Environmental Protection Agency estimates that we now generate 77 billion pounds of hazardous chemical wastes yearly (350 pounds for each person), and only 10 percent are processed safely.[29] Despite federal grants of nearly $19 billion over the last 10 years for waste-water treatment plants, two-thirds of all U.S. cities still dump partially treated sewage into nearby waters every day.[30] In addition, pollution from runoff of agricultural lands affects 68 percent of the river basins in the United States.[31]

There are several different types of water pollutants. Among the most common are microbiological contaminants -- bacteria, viruses, parasites -- which are usually treated with chlorine. Other pollutants include various solids suspended in water, such as clay, oil, or mineral fibers, and inorganic solutes, which are primarily trace minerals. Some of these are harmless or even beneficial. Others, such as lead, are highly toxic.

The most widespread and serious pollutants are organic chemicals. These come from several sources: run-off from farms and cities, waste from industrial plants; and effluents from sewage treatment facilities. Many of these chemicals are known to be dangerous, but we are just now beginning to understand the harmful effects they may have.

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*See Michael Baram, In Order to Have Water, report to the U.S. Department of the Interior, Bracken and Baram, Boston, Massachusetts, 1980.

The best-known example of chemical poisoning comes from the Love Canal, near Buffalo, New York, where a landfill containing 82 chemical compounds polluted the drinking water of a nearby housing development.[32] Residents fear that high incidences of cancer, birth defects, and respiratory and neurological disorders will result.[33] More than half of the families have now been moved with federal help.

Another typical example comes from Iowa, where a pharmaceutical company dumped chemicals into the Cedar River watershed, the source of drinking water for much of North-Central Iowa. One of the more dangerous chemicals has been found 65 miles downriver in the wells supplying Waterloo. Some scientists believe this pollution is directly linked to the fact that residents of both Waterloo and Charles City have elevated levels of bladder cancer.[34]

Pollution control efforts, while fairly extensive, have been less than adequate. One problem is that tests for many contaminants, especially organic chemicals, are complicated and costly. Another is that most activities to date have focused on "point source" pollution -- contamination which comes from a specific, identifiable spot such as an industrial plant or a sewage treatment facility. With this type of pollution, it is usually possible to identify the source and limit the damage. But at least half of the pollutants come from wider areas called "nonpoint" sources, and enter water in a diffused and diluted form. The major sources of nonpoint pollution are agricultural activities, road salting, city stormwater and street run-off.[35]

Over the past 10 years, the federal government has spent about $43 billion to control point source pollution,[36] and some progress has been made. But current funds allocated for the control of nonpoint sources total only $232 million.[37] And despite past expenditures, the states estimate that they need $100 billion to construct municipal wastewater treatment facilities adequate for their projected 1990 populations.[38] The Council on Environmental Quality suggests that to meet all current water pollution abatement laws will require spending $248 billion over the next decade.[39]

Pollution of surface water is not a recent problem. Even before toxic industrial and municipal wastes were dumped into our rivers and streams, they often received rotting leaves, animal and human wastes, and other natural debris. The big difference was that these natural products were usually part of the food chain, and rarely exceeded the stream's ability to clean itself. Today we contribute so much pollution that our waterways cannot clean themselves, and the problem has spread from our surface waters to a more serious location: our groundwaters.

More than half of Americans now get their drinking water from groundwater.[40] Once groundwater is polluted, it is extremely difficult to clean up, and the process may take decades. The reason is that groundwater does not have the natural cycle of purification that surface water does; there is no sunshine to evaporate it and remove salt and other pollutants. In addition, it flows so slowly that it cannot clean itself as it moves through the earth.[41]

Groundwater pollution is a slow but steady process. When water comes in contact with chemical wastes, it removes the soluble parts, forming a highly polluted liquid called leachate. The more water that contacts the waste, or the more liquid the waste, the more leachate is formed. This leachate can then enter surface waters or seep into groundwater.

The EPA has located more than 180,000 chemical waste disposal sites around the country. In a spot study of 8,200 of these sites, the agency found that 72 percent were nothing more than unlined holes in the ground, and 700 of these were within a mile of wells that used groundwater.[42] Reported cases of groundwater pollution are increasing: 44 in Massachusetts, 25 in Pennsylvania, more than 200 in California,[43] about 300 in Michigan.[44]

In addition to these dangers, we are now learning, ironically, that a primary method of purifying water may itself be causing pollution. Traditionally, microbiological contaminants have been controlled with chlorine. But researchers have discovered that in the purification process, chlorine interacts with the water and forms synthetic chemicals. Chloroform -- a known carcinogen -- is the most common, and a recent EPA survey of chlorine-treated water showed chloroform in over 95 percent of the finished samples.[45] A Columbia University study found that women who drank chlorinated water had 44 percent more risk of dying from cancer of the urinary or gastrointestinal tract than women who drink unchlorinated water.[46] Chlorinated water has also been linked to high blood pressure and anemia.

Pure water can still be found. But unless we are willing to pay the price to control the production and disposal of dangerous wastes, and practice conservation, good drinking water will become more and more scarce.

10. Climate

The weather is the most capricious variable in our food production system. The sun supplies most of the energy needed to grow crops, but if it shines too much, they wither and die. Rain provides the moisture plants need for life, but floods or hail can cause widespread destruction. Since the beginning of agriculture, man has been both blessed and cursed by the climate.

Modern technology has overcome many of the problems of farming, and even moderated the effects of bad weather. During a drought, for example, some farmers can irrigate their crops. Dams and drainage canals can limit flood damage. But these things have only limited success; our best efforts are no match for nature. As a result, scientists have focused primarily on trying to predict the weather, and then take steps to minimize any negative effect on our food supply.

Most people consider good weather to be "normal," while bad weather is abnormal. But what is normal with weather is variability.[1] In the past, people coped with hard times as best they could, and hoped to survive until better days came. The margin for error, however, is thinner now than ever. World population is at record levels and growing. Millions of people exist on minimal food and water, and a climate change that affects these could spell disaster.[2]

Only a few scientists are predicting that a sudden, major climate change, such as a new ice age, is likely in the near future.[3] Many suggest, however, that over the next 50 to 100 years there will be significant changes, with a profound impact on world food supplies.[4] Yet the primary concern is not with these long-term trends, which allow some time for adjustment, but with short-term changes that catch us largely by surprise.[5]

History does give us reason to worry about the weather. The past 60 to 70 years have been the warmest in the last millennium,[6] and agriculture as we know it has developed during this favorable time. But a recent CIA report warned that the world may be returning to the climate that existed for the 400 years prior to 1850, "an era of drought, famine, and political unrest in the Western world."[7]

Last year, parts of the U.S. suffered from drought, and the peanut crop was down 42 percent, while corn yields dropped 16 percent.[8] But when compared to the past, this was a very minor drought. Paleo-climatic reconstruction indicates that a drought lasting about 200 years afflicted the region of the state of Iowa beginning about 900 A.D.[9] There was a great drought over much of the country from 1276 to 1313, and it is difficult to comprehend the devastation that would result if such an event recurred. A lengthy drought hit the Midwest from 1884 to 1895, and between 1888 and 1892 half the settlers in Kansas and Nebraska left for greener fields.[10] And finally, the dry years of the 1930's ruined many farms and farmers.

Some forecasters see major droughts ahead. Dr. Douglas A. Paine, an atmospheric scientist at Cornell University, predicts that most of the country will experience a serious drought in 1982 and 1983, with a more limited drought lasting until 1986.[11] While many others dispute his findings, Paine gained some credibility by correctly predicting a wet spring in 1981.

Left to its own devices, the Earth does follow some general cycles. Right now, for example, we should be heading (very slowly) toward a new ice age. The inter-glacial period we have known during recorded history ought to be ending in the next 5,000 to 10,000 years.[12]

But things are not that simple, because many different factors have a significant impact on the weather. Some are natural, such as solar activity, planetary tides, and changes in the Earth's orbit and rotation. Others are man-related: the increase in atmospheric carbon dioxide (CO_2), the deterioration of the ozone layer, particles in the air, and heat generated by energy use.[13] And these factors interact in ways that make prediction extremely difficult.

Indeed, while most of us see little variation in overall weather patterns, it is important to realize that slight changes can have a significant effect on agriculture. A drop of 2°C. below the optimum temperatures of the 1940's would cut the growing season in much of the Midwest by 20 to 30 days.[14] On the other hand, a 1°C. increase in temperature and a 10 percent decrease in rainfall might reduce the wheat crop by 20 percent in the U.S. and the Soviet Union.[15]

One of the most widely accepted weather indicators is sunspots. Every 22 years, in a so-called Hale cycle, they return to their magnetic starting point. And over the years, droughts have occurred in a similar pattern.[16] The value of this knowledge is limited, however, because droughts do not occur exactly on schedule, and they also occur at other times in the cycle.

But most weather experts are primarily concerned with man-induced changes, especially the increase in carbon dioxide in the atmosphere. At present, our atmosphere contains a relatively modest 335 parts per million (ppm) of CO_2. But due to increased burning of fossil fuels, that level is expected to almost double by 2050.[17] Since CO_2 does not absorb much of the short-wave radiation from the sun, but does absorb a considerable part of the heat radiation from the Earth, this increase in CO_2, through the so-called greenhouse effect, could raise the temperature on earth significantly.

A recent study by seven atmospheric scientists from the National Aeronautics and Space Administration (NASA) argues that there has been an overall warming trend in global weather extending back to 1880, and the study links this trend to CO_2 build-up in the atmosphere. The scientists predict a warming of "almost unprecedented magnitude" over the next century, which among other things would cause extensive disruption of agriculture.[18] These conclusions were supported by a report that the summer Antarctic ice pack decreased by 2.5 million square kilometers between 1973 and 1980.[19] But the findings and projections of the NASA study are already the subject of considerable debate.

Some rather elaborate disaster scenarios have been constructed from this possibility. For example, if a CO_2 increase led to a 2°C. rise in Earth's temperature, the polar areas would likely experience even greater warming, while temperatures in the tropics would show little change. If the West Antarctic ice sheet -- the most unstable portion of the world's ice mass -- melted as a result of this heat wave, it would raise the world sea level 15 to 20 feet. This rise would inundate more than one-fourth of the states of Florida and Louisiana, and Boston, New York City, and Atlantic City would suffer similar fates. Parts of Texas, Virginia, Delaware and Washington, D.C. would be flooded. Billions of dollars worth of property would be destroyed, along with some important food-producing areas.[20]

But that's a big if. While CO_2 levels seem certain to rise, the resulting temperature may be offset by Earth's natural cooling cycle. Or changes in temperature could cause an increase in cloud cover, resulting in a lower surface temperature in another area.[21] So while most scientists suggest that some warming will result from the CO_2 increase, nobody knows how much or what impact this might have.

Another worry is the possible deterioration of the ozone layer around the earth, which protects us from damaging ultraviolet radiation. In the stratosphere, ozone is normally fairly stable. But when chlorofluoro-carbons (CFC's) -- man-made chemicals that help refrigerators keep cool and propel aerosol sprays -- reach the stratosphere, a complicated series of chemical reactions take place that converts some of the ozone to oxygen. Computer models suggest that the eventual ozone layer depletion may range from 5 to 28 percent.[22]

The increase in ultraviolet radiation reaching earth would not only increase incidences of skin cancer, it would lower yields from both farms and fisheries. Experiments show that some crops -- including sugar beets, tomatoes and corn -- might be "significantly affected" by a 16 percent ozone depletion.[23]

A weather-related problem that already affects food production is acid rain. This is caused by gaseous pollutants such as sulfur and nitrogen oxides, which combine with atmospheric oxygen to produce dehydrated sulfuric and nitric acid.[24] These pollutants are sometimes sent high into the air by tall smokestacks, and travel hundreds of miles before falling.

Acid rain has destroyed all the fish in more than 100 lakes in the Adirondack area alone.[25] Its effect on agriculture is somewhat unclear, but indications are that it can harm crops in two ways. First, it can damage the leaves of plants, affecting their photosynthesis. Second, it makes soil more acidic. While this can benefit some crops, such as tomatoes and strawberries, the overall effect is detrimental.[26]

Finally, there is the problem of desertification. Around the planet, man helps turn an area the size of Maine into desert every year.[27] Drought is a contributing factor, but the primary causes of desertification are expanding agriculture into areas that are not suitable for normal farming, ill-planned irrigation that causes soil salinity, overgrazing, and over-collection of wood.

Because of these destructive habits, 19 percent of the land surface of the world is threatened by desertification. At present rates of degradation, we will lose one-third of the planet's arable land by the year 2000.[28]

The land area affected by desertification in North America is surprisingly large. Harold Dregne, head of the International Center for Arid and Semi-Arid Land Studies at Texas Tech University, calculated that 1.1 million square miles, or 36.8 percent of the continent's arid lands, have undergone "severe" desertification. Some 10,500 square miles of the continent have undergone "very severe" desertification, according to Dregne. By contrast, Africa's "severe" desertification totals 4 million square miles, but its "very severe" desertification is less than North America's -- 5500 square miles.[29]

This estimate suggests that approximately 10 percent of the U.S. land mass is in a state of severe or very severe desertification. The actual acres threatened by severe desertification, however, are almost twice that amount.

Despite our technology -- and also because of it -- climate-related problems will continue to occur. The potential for serious trouble is not small; drought alone could disrupt our entire food system. And it is certain that climate-related problems throughout the world will put considerable stress on our food supplies in the years ahead.

11. Nutrition/Health

The most important function of any food system is to provide adequate nutrition to the people it serves. The best measure of success is not yields per acre, or number of varieties of food available, but whether all the people are properly fed. From this perspective, the U.S. food system is seriously lacking.

Despite our food abundance, good nutrition is not available to all the people in the United States. There are two basic reasons: lack of money, and lack of education about food. Until recent years, our concern was undernutrition. (Many Americans still suffer from hunger. See "Food Assistance.") Today, with 40 percent of American women and 32 percent of American men aged 40 to 49 technically classified as "obese," malnourishment can refer to overconsumption of food as well as to the consumption of dangerous food ingredients.[1]

In recent decades, our diet has changed dramatically. Since 1910, per capita consumption of fresh fruit has fallen 33 percent, while consumption of processed fruit has increased over 300 percent.[2] People now eat 74 percent fewer fresh potatoes than they did in 1910, but potato chip consumption rose 71 percent from 1959 to 1970.[3] During this same decade, milk consumption dropped 20 percent,[4] while consumption of soft drinks climbed 157 percent.[5] Americans now eat twice as much refined sugar (sucrose) as their great-grandparents did.[6]

There is growing evidence that directly connects our food habits with disease. Cardiovascular disease can be attributed partly to excess saturated fat and refined carbohydrates in the diet.[7] Tooth decay in children and young adults has likewise been linked to refined carbohydrates[8] and sugar consumption has been linked with obesity and diabetes.[9] High intake of salt may contribute to high blood pressure and its attendant ills -- stroke, congestive heart failure and kidney disease.[10]

Epidemiologic and laboratory data suggest that diet is an important cancer-causing factor, and it is correlated to more than half of all cancers in women and at least one-third of all cancers in men.[11] Lack of cellulose and other fiber in the typical U.S. diet is suspected of increasing the frequency of diverticulitis and colonic cancer.[12] In addition, increased fat consumption is linked to a high level of colon and breast cancers.[13]

The human body is designed to run on unprocessed foods, and some of the ingredients in our present diet are alien to our system. As a result, it is reasonable to question the wisdom of eating a high percentage of refined foods. Of the eight leading causes of death (See chart 1) in the United States, four have a strong causal link to the typical diet of high-fat, overly-processed foods.[14] A fifth illness, cirrhosis of the liver, is directly connected to alcohol abuse and subsequent malnourishment.[15]

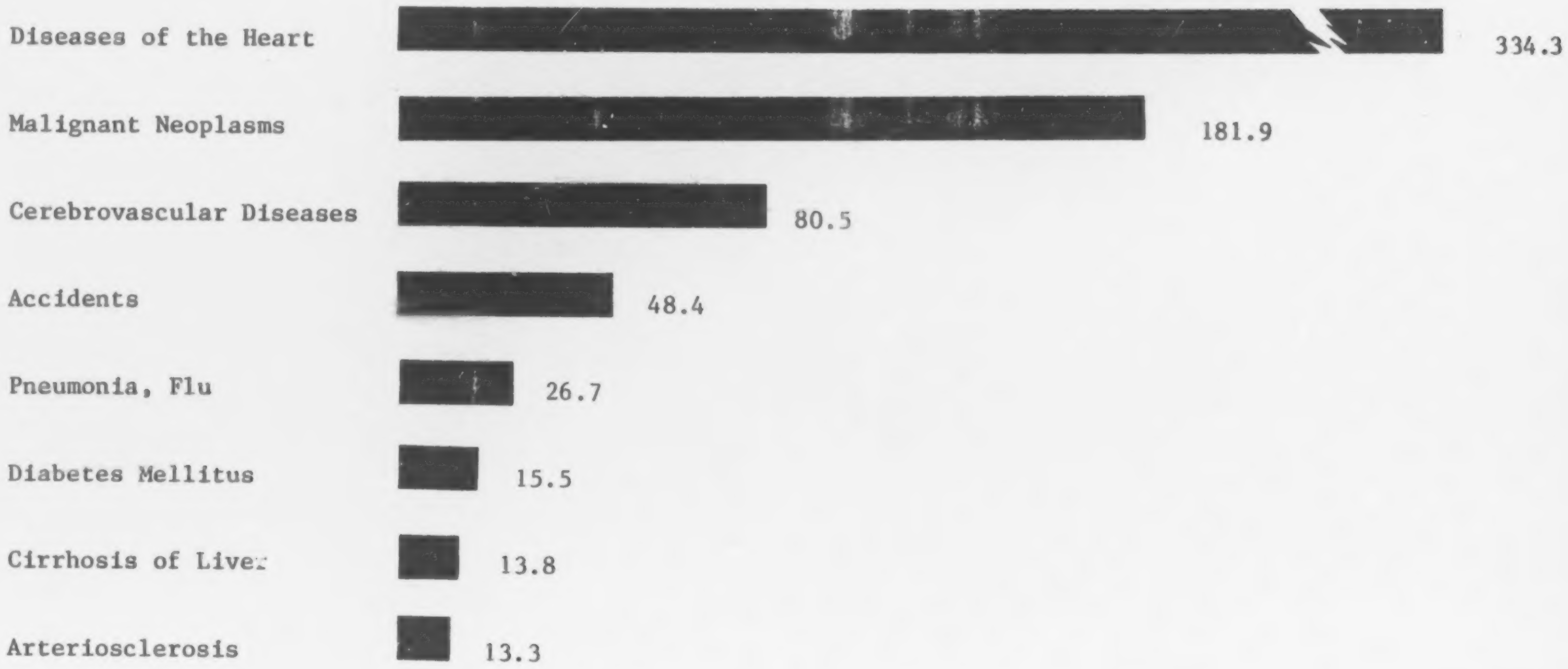
Increased mortality is not the only factor to consider. The medical bills caused by poor nutrition are enormous. In 1980, Americans spent over $500 million on antacid medications to assist their digestive systems.[16] Direct health care costs in the United States were about $192 billion in 1978, or $878 for each person. These direct costs include detection of disease, treatment, rehabilitation, research and training.[17]

Indirect costs, such as those due to losses from employment or homemaker services, are also substantial. Consider just the following: circulatory system diseases are estimated to cost $60.4 billion for direct costs, $44.3 billion for indirect costs; cancer is estimated to cost $22.3 billion — $5.3 billion for direct costs, $17 billion for indirect costs; alcohol abuse is estimated to cost $44.2 billion — $11.9 billion for direct costs, $32.3

CHART #1

LEADING CAUSES OF DEATH IN THE UNITED STATES (1978)

(rates per 100,000)



Source: U.S., Department of Commerce, Bureau of the Census
Statistical Abstract of the U.S., 1980, p. 79.
U.S. Government Printing Office, Washington, D.C.

billion for indirect costs.[18]

Even these dollar figures, huge as they are, miss the human dimension of the problem. Millions of men and women suffer needless discomfort and pain every day, and many die prematurely. It is a continuing scandal that in America, a land flowing with food, so many people are improperly nourished.

12. Food Processing

In the beginning, food was processed primarily for preservation. Sometime after 4000 B.C., the Egyptians developed a fermented sourdough wheat bread which would keep for months without spoiling. Other natural preservation methods such as drying, salting, and smoking were known and practiced as early as 3000 B.C. The first commercial-scale processing began during the Roman Empire with the production of bread, wine, fruit preserves, cheese, bacon, and olive oil.[1]

Today, while processing for preservation is still important, many products are processed for convenience. Over 75 percent of the food Americans eat is processed in some way,[2] from waxed apples to frozen TV dinners. In the last 50 years, per capita consumption of processed fruits and vegetables has risen 300 percent while consumption of their fresh counterparts has decreased 33 percent.[3] During this same period, consumption of frozen potato products has increased 700 percent.[4]

There are several reasons for the popularity of processed, "convenience-type" foods. People want food which can be prepared quickly, with less time and effort than dishes created "from scratch." Greater affluence, decreasing household size, and the spread of microwave ovens have encouraged the use of convenience foods. In 1978, convenience foods accounted for one-third of consumer food expenditures.[5]

Processing extends the shelf life of many foods, increasing the time they are available to shoppers. It also destroys microorganisms which might otherwise be harmful to health. But food processing has taken its toll in tremendous expenditures of energy, loss of nutrients, higher retail prices, and possible health hazards.

Food processing takes almost one-third of the energy used in the U.S. food system, consuming 1.8 million barrels of oil equivalent per day.[6] About 1000 calories of energy are expended for each calorie of processed food we consume. This energy is used to wash, cut, steam, boil, freeze, dry, mill, refine, bake, can and package food. Beet sugar production is the most energy intensive processing operation, using about 8.5 percent of all food processing energy, while poultry and egg processing uses about 0.5 percent of the total. Frozen fruits and vegetables take about twice as much energy for processing as their canned counterparts.[7]

This energy consumption is passed on to the consumer in higher food prices. The more highly processed the food, the more it costs. Potatoes are a good example:

Fresh potatoes	$ .29/lb.
Canned potatoes	.33/lb.
Frozen potatoes	.70/lb.
Instant Mashed potatoes	1.39/lb.
Potato Buds	1.76/lb.
Lay's Potato Chips	2.44/lb.
Pringle's Potato Chips	2.58/lb.[8]

Manufacturers often promote their most highly processed products, since these return the greatest profits.

Another drawback is the nutrient losses that occur during processing. In the canning of green beans, for example, approximately 45 percent of the vitamin B-1 is lost; with tomatoes about 30 percent of the vitamin C is lost.[9] During the refining process, white flour is robbed of most of its vitamins, minerals, iron and fiber, and iron and B-vitamins must be replaced through enrichment. In the United States, enrichment of milled cereal products is mandated in 30 states.[10]

In recent years, it has become common practice to fortify processed foods with vitamins and minerals. Fortification does boost nutritional value, but it also increases cost, and many of these foods still lack fiber, and are high in fat, sugar, salt, or other additives. (See "Nutrition/Health.")

Indeed, the use of food additives has skyrocketed in recent years. About 2700 are now in use, a jump of 40 percent over 1970.[11] Shipments of additives were valued at $1.3 billion in 1978, and are estimated to reach $4.5 billion by 1990.[12] These additives are used to enhance flavor, improve texture and appearance, heighten color, retain or boost nutritional value, prevent spoilage, and sweeten artificially. The average American consumes his weight (about 139 pounds) in additives per year, primarily sugar, salt, and corn syrup.[13]

While most food additives are safe, some have negative health effects from long-term use at low exposure levels. A small number, including Violet Dye No. 1 and Red Dye No. 2, have been banned from use as suspected cancer-causing agents.[14] Most food labels now provide a complete listing of food additives, but it is difficult for consumers to know which of those compounds are harmless and which of them may be dangerous.

The final step in food processing is packaging. In 1980, Americans paid more than nine percent of their total food expenditures -- some $34 billion -- for packaging.[15] While packaging often provides necessary protection, and makes handling more convenient, many packages cost more than the foods they contain. Beer cans cost five times as much as the brew they hold, while soft drink cans, chewing gum wrappers and breakfast cereal boxes cost about twice as much as their contents. At the other end of the spectrum, butter, cheese and poultry packaging costs less than 10 percent of the food ingredients.[16]

Part of the high cost of some packaging reflects the energy needed to produce it. 1.3 percent of the nation's energy consumption is used for packaging.[19] It takes 1643 calories of energy, for example, to produce a

12-ounce aluminum pop-top soda can which contains a drink with 150 calories of food energy.[18]

Processing and packaging food keeps it safe from many old enemies, such as mold, decay, and dangerous microorganisms. But these activities burn vast amounts of energy, and they have created some new threats, such as harmful additives, decreased nutritional value, higher prices. Increasing reliance on heavily processed and packaged food can only lead to inflated food costs, excessive energy waste, and deteriorating health.

13. Fisheries

Fish provide 5.4 percent of the world's protein, more than the amount provided by beef, or pork, or eggs.[1] United States per capita use of fish and shellfish was 51 pounds in 1980, and about half of that amount was used as human food.[2] The demand for fish is increasing, but it is questionable whether even our present levels of production are sustainable.

The U.S. fishing industry employs some 277,000 people, and it contributed $7 billion to the GNP in 1980.[3] Since 1945, the U.S. fish catch has increased 41 percent. At the present time, 56 percent of the fish landed here are eaten by people; the rest are used for industrial purposes -- generally as livestock, pet, or poultry feed.[4]

Despite controlling some of the world's richest fishing grounds, (almost one-fifth of the world's main fisheries resources are within 200 miles of the U.S. coasts), the United States imports almost 50 percent of its fish, and most of the imports are used for human food.[5] Competition for this supply is likely to intensify, since the United Nations predicts that world fish demand will increase 50 percent by the year 2000.[6] Significantly, about three-fourths of the increase in U.S. fish catch in the last three decades has been of lower-quality fish used for animal feed.[7]

The most serious problem confronting our fisheries is depletion of stocks. Despite the establishment of the 200-mile Fishery Conservation Zone, an area in which foreign fishing is restricted, U.S. fishermen are still concentrating their efforts on a few intensively-fished species. Just seven varieties of fish -- menhaden, tuna, salmon, hakes, flounder, alewives and cod -- account for 74 percent of the U.S. catch.[8] And while there is little potential to increase harvests of these species, there are a large number of species in the Fishery Conservation Zone which remain underutilized.

Intensive fishing of a small number of species not only depletes the stocks of these fish, it also drives up prices, and "wastes" the unconventional species which are used as food in other countries. Worldwide, 21 species of commercial grade fish have already been depleted by overfishing.[9] Meanwhile, in the United States, so-called "trash fish" make up a sizeable portion of all fish caught. East coast fishermen have reported that 30 percent of their catch is of undesirable or non-traditional species which are often discarded at sea and frequently killed in the process.[10]

Energy use presents another challenge. The U.S. fishing fleet uses 27 calories of fuel energy to harvest one calorie of fish protein.[11] Each year, over $400 million worth of fossil fuels are used to build and operate commercial fishing vessels.[12] A major factor in the increasing rate of fuel use is the increasing amount of time spent searching for fish. In 1980, 54 percent (by dollar value) of the U.S. catch was made more than three miles offshore.[13]

Another reason for increased energy use is the trend toward bigger boats. A large vessel uses considerably more fuel energy than a number of smaller vessels with an equivalent harvesting capacity. For example, 22 fifteen-ton boats have the same capacity as a single 333-ton boat, but the small boats are 44 percent more energy efficient in obtaining the same catch.[14] In addition, small vessels employ more people and are more adaptable than large vessels.

Specialization -- fishing for one particular species -- further decreases energy efficiency, since fishermen must fish longer to catch what they want. The more specialized the fisherman, the more energy is wasted. Lobster and shrimp fishermen, for example, use over 150 calories of fuel energy for each calorie of protein harvested. On the average, one-half gallon of diesel fuel is used to harvest a single one-pound lobster which will yield a quarter pound of lobster meat.[15]

Our fishing grounds are also damaged by water pollution. The Environmental Protection Agency received reports of 425 pollution-caused fish kills in U.S. waters between 1961 and 1975,[16] and these reported incidents are only a fraction of the total deaths. Sublethal concentrations of various pollutants can interfere with fish behavior and physiology, increase the incidence of disease, and change migration patterns.

Even though the world's oceans provide 98 percent of our fish, we use them as dumping grounds. Five million tons of petroleum hydrocarbons leak, spill or are dumped into the oceans each year,[17] an amount equivalent to 35 million barrels of oil. Seven million tons of litter are discarded annually into the oceans. Heavy metals such as mercury, copper, zinc, cadmium and lead are turning up in increasing amounts, and these minerals are highly toxic to fish and to the people who eat the fish.

The cost of this pollution is only now becoming apparent. Environmental changes on the Connecticut shoreline have resulted in losses of over $1 billion in shellfish revenues. In 1975 alone, U.S. fishermen lost over $37 million in potential income because of shellfish acreages that were closed by pollution.[18] But the most significant impact on fisheries is from chronic, low-level pollution sources which have a considerable lag time. The impact of pollutants entering our waters now will be most serious in coming years.[19]

Development is a growing threat to many coastal fishing areas. Tidal marshes, estuaries and other shore areas which are essential to our fisheries are also in demand for recreational and residential purposes. Some 60 to 80 percent of all commercial marine fish species are dependent on estuarine ecosystems during at least part of their lifetimes. At the same time, 60 percent of the U.S. population is concentrated in coastal counties.[20] When there is a conflict, development pressures usually win out over fishery interests.

Coastal development, water pollution and intensive fishing of a few species have put increasing pressure on our fish stocks. When these problems are coupled with rising fuel costs and decreasing energy efficiency, we can see clearly that our fishing industry is in serious trouble. If we do not make significant changes in the management and methods of fishing, we are likely to squander this crucial protein source.

14. Forest Resources

Trees are an important part of our food system. They are the source of fruits, nuts, legumes and roughage, and they provide packaging materials for food. Trees also produce wood for construction, energy and heating purposes.

Trees are often accused of taking up land that might otherwise be used for farming. But they play an important role in soil building, and improve local atmospheric conditions by lowering summer air temperatures, increasing humidity and rainfall, and decreasing wind velocities. They use land too hilly or rocky to farm. In short, forests are an essential part of our agriculture system.

At the present time the world's forests are being cut faster than they are growing. And although annual tree growth in the United States exceeds the annual harvest, this country is partly responsible for deforestation in other parts of the world.

About one-third of the United States is forestland and two-thirds of this amount is classified as commercial timberland -- land capable of producing commercial crops of timber.[1] On a per-acre basis, the United States has the most productive forest in the world; it is second in terms of commercial forest volume and third in area of commercial farmland.[2] The harvest value of domestic timber is over $6 billion each year.[3]

Despite this wealth of forests, the United States has been a net importer of wood since 1950.[4] Imports have been rising steadily. In 1978, the United States imported 3.7 billion cubic feet of wood, a quarter of all the wood consumed that year.[5] Imports are expected to double by 1990.[6]

These imports contribute to deforestation in many countries. Not only does the United States use large amounts of foreign wood, but we import 100,000 tons of beef from Central American countries each year -- countries which are cutting down their forests at a frightening rate to open up grazing land for cattle production.[7]

This deforestation also has a negative effect on the Earth's atmosphere. Forests are like human lungs in reverse: they take in carbon dioxide and give off oxygen. Since forests store 90 percent of the total carbon in our global ecosystem, even small changes in the world forest cover have a significant effect on atmospheric carbon dioxide levels. (See "Climate"). In the tropics, land clearance is occurring so rapidly that it contributes more carbon dioxide to the atmosphere each year than the worldwide combustion of fossil fuels.[8]

While global demands for wood are increasing, our own forest reserves are shrinking, making the United States less able to meet even its present needs. U.S. forestlands are being converted to other uses at a rate of 1.5 million acres each year.[9] Globally, deforestation is occurring at a rate of 50 million acres yearly — an area the size of the state of Washington.[10]

Forest management is another problem. Under current management practices, commercial forestlands are producing less than half the net growth that could be attained in correctly stocked natural stands.[11] Farmland and miscellaneous private lands, which make up 60 percent of the commercial forestland in the United States, currently contribute only 50 percent of the nation's saw timber harvest.[12]

Much of the privately held forestland is divided into parcels which are considered too small to be profitably harvested. This judgment, however, is partly due to the lack of financial incentives for managing and selling timber. The Forest Service's policies for selling logging rights in National Forests help keep timber prices at low levels. In many cases, the Forest Service sells timber at prices below operating costs, since they sell according to calculated market value without making allowances for longterm management costs such as reforestation. This policy subsidizes the forest industry with taxpayer dollars, encourages timber cutting in the National Forests, and depresses timber prices, discouraging private landowners from making investments in timber management.

In most forestlands, pesticide and erosion problems have not been as severe as they are in croplands. Pesticide use in forests accounts for less than 5 percent of the nation's total consumption.[13] United States timber lands have an average soil loss of 1.2 tons per acre. But in six states -- Arkansas, Georgia, Hawaii, Illinois, Ohio and West Virginia -- erosion rates on grazed forestlands are over 11 tons per acre.[14] And in many incidents, the spraying of pesticides, herbicides and defoliants has been destructive to wildlife and to human health.

If the United States demand for timber leads to increased domestic production, it is likely that this good record will be tarnished, however. Increasing reliance on artificial regeneration, row-planting of genetically similar species, clearcutting, dependence on pesticides, herbicides, and chemical fertilizers, and use of large machinery will intensify the problems of soil erosion and wildlife destruction.

As long as the United States is dependent on foreign timber, we cannot rightfully claim that a "conservation ethic" is preventing us from using our own forests more fully. Because of our high per capita use of timber, the preservation of our forests is now occurring at the expense of forests elsewhere. Trees are essential, not only for the food and wood they provide, but also for the oxygen they provide and the carbon dioxide they clean from the air. Slow destruction of the world's forests means slow destruction for our entire environment.

15. Urban Food Systems

About 74 percent of the U.S. population live in metropolitan areas.[1] These built-up areas have not been designed to include a basic food resource for the community, and virtually all food must be imported from a considerable distance. In the past, our food system has been so successful in producing an abundant and dependable supply that city dwellers generally take food for granted and do not think about where it comes from or how it is produced.

Feeding a city is no easy task. Philadelphia, with a population of 1,755,000,[2] consumes 2.6 billion pounds of food each year, or over 7 million pounds every day.[3] Hauling this amount of food into the city requires more than 175 trucks each day.[4] Philadelphia residents spent nearly $1.8 billion for their food in 1980,[5] $95 million of which is for transportation.[6] More than 70 percent of the city's food comes from outside the state of Pennsylvania.[7]

Because cities are so food-dependent, announcing "food shortage" in a metropolitan area could lead to disaster. Stores would be emptied almost immediately and large segments of the populace would be left without food. But the design of our system has set the stage for this to happen.

This vulnerability is relatively new. Specialty crops -- fruits, vegetables, nuts, mushrooms -- have traditionally been produced near urban areas, making intensive use of land, and yielding higher economic returns per acre than most other types of agriculture. In 1978, 23 percent of all U.S. farms were located within Standard Metropolitan Statistical Areas.[8] At that time, these metropolitan agricultural areas produced 26 percent of the value of all commodities sold in the 48 contiguous states.[9]

Agricultural land near urban areas is rapidly disappearing, however. During the years from 1967 to 1975, 16.6 million acres of farmland were converted to urban and built-up uses, and 6.7 million acres were permanently flooded. About 5.4 million acres had been cropland, and of this, 4.8 million acres were taken for cities, villages, industrial sites, railroad yards, cemetaries, airports, golf courses and other uses requiring more than 10 acres. And for every acre that is taken for urban uses, another acre is idled and isolated by noncontiguous development. On this basis, urbanization may have actually taken nearly 10 million acres out of cropland from 1967 to 1975.[10]

Suburban sprawl not only occupies land, it also increases taxes for the remaining farms. Land values soar and profitability decreases. Unstable conditions make farmers reluctant to make improvements and further investments. They have no incentives to practice conservation and improvement measures. This in turn makes the farm less attractive as a farm, and more inaccessible to those who want to enter farming.

New suburbanites sometimes object to many agricultural practices, and make it difficult for farmers to work. Such things as use of pesticides, fertilizers, and herbicides, livestock odors and wastes, noisy tractors and equipment, and escaped livestock are sources of contention. Farmers, on the other hand, must deal with air pollution and congestion caused by automobiles, theft, vandalism, and the disruption of family farm life and values. The easy solution is to sell and relocate away from population centers, or simply sell and take a regular job. So that is what often happens.

But every time a farm near a metropolitan area is lost, the situation worsens. People must have food, and the long-distance system that supplies our urban areas is seriously deficient. Without more local food sources, any supply breakdown will mean hunger in our cities.

16. Food Assistance

Today one in every eight Americans is poor. According to the Census Bureau, the number of poor people in America now stands at more than 29 million, a jump of 3.2 million between 1979 and 1980.[1] Access to food is one of their most serious problems. While it is true that the average person in the U.S. spends less than 15 percent of their disposable income on food, the poor spend close to 40 percent.[1a]

It seems inconceivable that in a country with such a sophisticated and elaborate food production and distribution system, hunger and malnutrition still exist. But a recent National Food Consumption Survey showed that fewer than 10 percent of poor families received all their Recommended Daily Allowances (RDA's) of essential nutrients. Less than 50 percent received even two-thirds of their daily requirements.[2]

The barriers which deny poor people a nutritious, affordable diet fall into three categories: 1) lack of means; 2) lack of access to competitively priced foods; and 3) lack of nutrition education. All of these problems are being addressed to some degree, but the success of government's efforts to end hunger has been rather mixed.

Federal food assistance had its beginning in the food distribution program, established in 1935 to aid farmers who could not find markets for excess products. The government bought the food and gave it to poor families.[3]

Things have come a long way since then. Today the U.S. Government sponsors 13 major programs which provide food or food assistance. Among these programs are Food Stamps, School Lunch and Breakfast, Special Milk, Child Care Food, Summer Food, Women, Infants and Children (W.I.C.), Elderly Feeding and Food Distribution. In 1976, federal expenditures for all food programs were over $8 billion, a seven fold increase from 1967.[4] In fiscal 1981, the U.S.D.A., which administers most of these programs, spent $16.6 billion — more than 60 percent of its budget[5] -- on food assistance, more than $75.00 for every person in the United States.

While government food programs have helped reduce hunger and malnutrition in the United States, they face considerable problems. Many needy, eligible people don't participate in the programs because they don't know about them, or for varied reasons they choose not to join. Those who do participate often receive benefits below the subsistence level. The effectiveness of food assistance programs, especially Food Stamps, has been reduced by the mass exodus of supermarkets from inner cities and the lack of supermarkets in rural areas. As a result, poor people in these places must purchase higher-priced and lower quality food from smaller, local grocers. Lack of adequate nutrition education puts the poor at greater nutritional risk since they often are unaware of relationships between diet and health. And the effect of these difficulties -- lack of resources, markets and information -- is to perpetuate hunger and malnutrition among America's poor.

A closer look at some specific programs brings these problems into sharper focus.

The Food Stamp Program (FSP) is the primary federal effort to help low-income households afford adequate diets. It does this by increasing income, in the form of stamps that can be used only for food purchases. The program was mandated by the Food Stamp Act of 1964, and is administered by the USDA. Last year the FSP served almost 23 million people, and the 1981 budget is nearly $11.5 billion.[6]

With so many people now receiving food stamps, the economic repercussions of the program are extensive. For every $1.00 in food stamp benefits spent, there is an additional $3.64 worth of economic activity, 35 cents worth of economic retail sales and 42 cents worth of farm sector revenues.[7] Overall, food stamp spending generates an additional $4.2 billion annually in retail food sales, above what would have been spent by poor people without food stamps. Food stamp spending also generates an additional $1.7 billion in farm income.[8]

Since its founding, the FSP has undergone major modifications in its policy, eligibility requirements, and administration. Until the late 1970's, participants in the program were required to purchase food stamps. (For example, $25 had to be spent to obtain $50 worth of stamps.) Now, however, stamps may be obtained free. That change brought in 3 million new participants in 1978 alone, including many elderly and rural residents, and people so poor they did not have the cash to purchase coupons under the old system.[9] The food stamp budget rose accordingly, with 1981 expenditures more than double the 1976 level.

Despite this growth, however, estimates are that the FSP reaches only 60 percent of those eligible.[10] And for those who do receive the stamps, the funding level is far from adequate.

The average American family of four spends about $400 per month for food at home. Yet the average food stamp family of four, with a monthly income of $320, gets only $158 worth of food stamps per month.[11] With no income whatsoever, a four-person household could receive a maximum of $233 worth of food stamps each month.[12] Yet the absolute lowest food budget required to purchase a healthful diet for a family of four (includes children, aged 6-8 and 9-11), according to July, 1981, USDA figures, is $246.50.[13]

Consequently, the average food stamp family receiving $158 worth of stamps can only obtain about two-thirds of its daily nutritional requirements. The

USDA acknowledges that only about 16 percent of those spending at this level will obtain adequate diets.[14]

As costs rise, the plight of food stamp families worsens. From September, 1976, to November, 1979, the average gross income of food stamp households rose 17 percent, but the cost of living went up 32 percent. Meanwhile, the average per capita income of the U.S. population rose about 40 percent.[15] Despite these inadequacies, federal cutbacks in the food stamp budget have begun, and these will exacerbate existing problems, and affect retailers and farmers as well as recipients. Cutbacks may have serious consequences for supermarkets, especially those which obtain 5 percent or more of their total sales from food stamps. Food stamps now account for an average of 3 percent of total sales for both chain stores and independent retail stores, equivalent to about $3 billion in revenue for each type of store for 1980.[16] Farmers stand to lose over $650 million in revenue.[17]

But the biggest losers will be the recipients themselves. Under the Reagan Administration's plan, eligibility will be based on gross income rather than net income, and about 1 million people will lose food stamps completely. The remaining 21.6 million recipients will have their benefits reduced.[18] Despite these cuts, the food stamp program will increase $500 million in fiscal 1982, as cuts in other federal programs for the poor push more people onto food stamps or make them eligible for higher benefits.[19]

In addition to budgetary and administration complexities in food assistance programs, fraud and mismanagement, especially in the FSP, account for the loss of $1.6 billion.[19] If this massive fraud could be stopped, cutbacks would be unnecessary. Studies have shown that about 10 percent of all stamps are obtained illegally, primarily through thefts of authorizations to purchase (ATP) food stamps.[20] A special Washington-based unit, composed of officials from the Justice Department, USDA and the U.S. Postal Service, has recently been established to coordinate investigations of large-scale fraud in the FSP around the country.

The National School Lunch Program, which provides free or reduced cost meals to 26.7 million children every school day, will also be scaled down. Since eligibility for free meals is tied to food stamp eligibility, those children whose families are eliminated from the FSP will no longer be entitled to free school lunches. Depending on family income, they may be eligible for reduced-priced meals, the cost of which will probably rise from 20 cents to 40 cents.[21]

Finally, there is the question of whether these cutbacks in food assistance will actually save money. A case in point is the W.I.C. program, which provides specified food supplements to pregnant women, mothers, infants and children. At present, it reaches only 1.4 million of the more than 11 million persons eligible, and one-third of all counties in the nation still have no W.I.C. program.[22] Yet a study by the Harvard School of Public Health found that the United States saves $3.00 in avoiding hospital costs for newborn infants for every $1 spent on the W.I.C. program.[23]

Despite good intentions, the U.S. food assistance programs are not really working. More and more people are becoming eligible for help, the cost of food is increasing, and hunger and malnutrition persist. The problems of the poor -- lack of food, bad housing, inadequate education, and unemployment -- are mutually reinforcing. Each one percent increase in unemployment, for example, adds from 1 to 1.3 million persons to the Food Stamp Program and costs the government $580 million in benefits.[24] Until we can break the cycle of hopelessness caused by the inequitable distribution of income in this country, the need for food assistance will continue.

17. International Dimensions

Without U.S. food exports, the problem of hunger and malnutrition around the world would be far worse. Many countries would need to alter their diet completely. Meat consumption in Japan, Europe, and the Soviet Union would plummet, since American grain would no longer be available to feed livestock in these places.

At the same time, without foreign markets the U.S. food system would suffer considerably. Two out of every five cultivated acres in the U.S. is now planted in food for export. If these markets were not available, many farmers would be out of business, as huge surpluses drove prices below profitable levels. Extensive imports allow us to enjoy food that might otherwise be unavailable, and provide important income to the producing countries.

But these mutual benefits do not tell the whole story. Our food imports and exports have a number of negative side effects, both for the U.S. and its trading partners, especially those nations that are under-developed.

Food Imports

Although the United States is called the world's breadbasket, it is also a major importer of food. About 10 percent of our $300 billion 1980 food bill[1] paid for food grown outside this country.[2]

Some of that food -- termed complementary imports -- could not be grown easily here. These imports, primarily coffee, cocoa, and tropical fruits, accounted for less than half the total. A majority of our imports were supplementary -- products such as meat, sugar, dairy products and grains, which could be produced here. Since 1975, our dependence on imports has grown 70 percent, with most of this increase coming in complementary foods.[3]

Transporting imported food to this country uses huge amounts of fuel. Long supply lines make these food sources especially vulnerable, either to shipping disruptions or local problems, such as political unrest or drought. And purchasing food overseas means the money does not go into the pocketbooks of America's farmers.

Imported food may also contain a hidden health threat. Pesticides that are restricted or banned in this country -- including DDT, aldrin, and dieldrin -- are often sold abroad legally, and may return on the coffee, bananas, and other food imports we buy. Occasional border checks show that at least 10 percent of all imported food is contaminated with illegal levels of pesticides.[4]

Further, the income from imported food may not benefit poorer countries as much as is often claimed. About 40 percent of our supplementary food imports come from developing countries -- places that often have problems of hunger and malnutrition.[5] In many of these nations, the best land no longer grows food for local consumption, but export crops such as coffee, cocoa, rubber, and meat. During the 15 years from 1952 to 1967, for example, cotton acreage in Nicaragua quadrupled, while the cropland in basic grains was cut in half.[6] These changes may increase foreign exchange, but they have made many Third-World countries less able to feed themselves, and hence more dependent than ever on outside food.

Most of the agricultural exports from developing countries are shipped as raw materials. This practice means a low return to the farmer and little stimulation for local economic development. In contrast to manufactured goods, the prices paid on world markets for many raw products have declined in recent years. The price of bananas has fallen 30 percent in the last 20 years, while the price for cocoa has fluctuated widely, and had an overall decline of 80 percent since the 1950's.[7] When cash crops are produced for export, American farm technology is seldom far behind, despite the fact that it may not be appropriate for other countries. While highly productive, our food system is an intensive energy consumer. If all the world was fed on a U.S. diet produced with our current agricultural technology, food production alone would use up all the world's known petroleum reserves in just 11 years.[8]

Finally, the growing of cash crops for export has brought a range of local problems, including pesticide poisoning and environmental destruction. The World Health Organization estimates that half a million people are poisoned by pesticides each year.[9] In Costa Rica, which has tripled its beef production over the last 20 years to increase exports, about one-third of the forest and woodlands have been destroyed to provide for more pastureland. During this time, local per capita meat consumption has declined.[10]

Food Exports

The United States is the world's leading food exporter. Roughly half the agricultural products on the world market come from America, and this figure may rise to 60 percent over the next decade.[11] Total food exports are expected to reach $48 billion in 1981, up from $40.5 billion in 1980.[12]

This food plays an important role in improving our balance of payments, and may provide a $27 billion trade surplus in 1981.[13] Farm sales overseas account for 20 percent of farm income, and create nonfarm jobs for 630,000 workers. Forty percent of all the acres harvested in the United States produce food for export.[14]

These export sales are often heralded as an unadulterated good, providing numerous benefits to farmers and to the country. The current administration, in President Reagan's words, is "committed to the aggressive expansion of agricultural exports."[15]

Exports of grain and soybeans have grown very rapidly in the last 30 years. In 1950, we exported 15 million tons of grain; last year the total was 119 million tons.[16] In 1979, the United States exported 62 percent of its wheat production, 31 percent of its corn, 36 percent of its soybeans, 63 percent of its cotton, and 45 percent of its fats and oils.[17] Since 1970, U.S. exports of feed grains have increased 350 percent.[18]

The majority of our exports -- about two-thirds -- go to industrial nations.[19] In recent years, while exports were skyrocketing, the amount of food aid has been declining. Only about 15 percent of U.S. food exports in developing countries are in the form of aid, compared to more than 50 percent 10 years ago.[20] The lion's share of our exports is in the form of feed grains, which go to developed countries to satisfy their craving for more meat.

While U.S. food aid is usually thought of in a humanitarian light, that is somewhat misleading. The original intent of Public Law 480, which created the Food for Peace Program, was to create and expand commercial markets for U.S. food in other countries.[21] Subsidized wheat exports under this program averaged 12 million tons a year during the early 1960s, when we had an extensive grain surplus. But as the world demand for grain increased, wheat aid fell to about five million tons annually by 1970.[22] At the present time, fully 85 percent of America's food exports to developing countries are on commercial terms.[23]

There is no doubt that U.S. food aid has helped feed millions of hungry people. But our export policy has also meant that many countries are now more dependent on our help than ever before. And with the world population increasing at about 70 million per year, the burden of trying to feed these people has proven to be a difficult one. In 1980, for the second year in a row, more grain was consumed worldwide than was produced,[24] but good harvests in 1981 may leave us with a surplus.

When a developing country increases its dependence on imported food, several things tend to happen. Traditional, subsistence agriculture is abandoned, and jobs in rural areas are lost. More people move into the cities, which are often overcrowded already. The temptation grows to neglect rural development and agriculture programs, and concentrate on other expenditures, such as military equipment. Monopolistic patterns of land ownership are reinforced, thereby widening the gap between rich and poor people.[25]

After a careful study of the situation, the Presidential Commission on World Hunger concluded:

> Self-reliance in the developing countries will never be achieved as long as U.S. agricultural policies continue to work against it. Only when the U.S. agricultural system is itself more self-reliant will the contradiction between U.S. domestic and international policies be reconciled. Far-reaching changes in current policies will be required if U.S. agriculture is to be restructured on a more self-reliant basis.[26]

Heavy farm exports are not an unmixed blessing to the United States, either. Because the world demand for surplus grain fluctuates considerably, exports have a major impact on domestic prices. During the years from 1972 to 1978, for example, when food exports increased dramatically, the prices farmers received for all crops varied five times as much as during the 1964 to 1971 period.[27]

When demand for grain is high, it pushes the price up, and two things happen. The price of grain in the United States increases, and poorer countries who desperately need food are sometimes priced out of the market. If current rates of exports continue until 1990, USDA economists predict it will result in an 85 percent increase in the price of wheat, corn, and soybeans.[28] And two economists at Columbia University recently concluded that the large grain sale to the Soviet Union in 1972 "cost American consumers a reduction of meat consumption valued at $3.3 billion by 1975."[29]

Along with our food exports, we are, in essence, exporting our topsoil. Most export crops are row crops, which are particularly susceptible to erosion. Already, national erosion rates for soybeans, corn, and wheat exceed the maximum tolerable rate, the level at which the soil's fertility can be maintained.[30] In 1980, about 2 billion tons of topsoil was eroded from U.S. farmland growing export crops.

By the turn of the century, exports alone may require an additional 110 million acres of cropland.[31] This will mean that more marginal land will be brought into production, and the erosion problem will worsen. In addition, this demand will contribute significantly to the land squeeze in this country, and all available land may be in production by the turn of the century.[32]

Finally, while American food imports make a positive contribution to our balance of payments, there is a problem here as well. For every dollar's worth of agricultural exports shipped abroad, we used about 25 cents' worth of imported oil to produce the food. In the near future the cost may rise to 40 cents.[33] So increased food production for export makes us more dependent on foreign oil.

U.S. food trade provides some important benefits to both American farmers and foreign consumers. But our current policies with imports and exports cause serious problems -- higher world food prices, decreased self-reliance for other nations, and serious soil erosion in the U.S. While the world grows more dependent on our food, we are destroying the productive base that might supply this food.

WHAT WE CAN DO ABOUT IT

1. Goals for the U.S. Food System

The previous pages document the debilitating trends that are threatening the U.S. food system. They outline the full dimensions of our food system problems and, in total, make the alarming points that: 1) The situation is much more dangerous and immediate than most people realize; and 2) The combined effect of all these problems could collapse the system before any one of them becomes critical. Stated another way, all the parts of the food system may seem to be behaving rationally, but the whole system is irrational and non-sustainable.

As the title of our project and as this section make clear, there is an optimistic dimension to our point of view. Our food system faces serious challenges, but there are a host of responses that could transform it into a sustainable, efficient and economical organism which would create enormous benefits for American farmers, consumers, and businesses.

In order to judge which responses to our food system challenges we wish to implement, we need to know where we are going and, more importantly, where we want to be going.

In navigation, knowing where you want to go is at least as important as knowing where you are and how you will travel. Without a destination, navigation becomes meaningless. Without goals, the path becomes impossible to chart and progress cannot be measured because there are no benchmarks of present position or future goals. One of the reasons for the numerous problems of the U.S. food system is a lack of clear-cut, long and medium-range goals, a fact which makes navigation extremely difficult.

The Cornucopia Project's goals for the U.S. food system are presented as a tool for judging progress, and for helping decision-makers determine if the myriad individual decisions that need to be made in the course of normal food system activity are in the "right", or explicitly chosen, direction. Because some of the goals may be new to agriculture and the U.S. food system, or because they deal with larger systems and issues than the food system decision-maker is used to, they may strike some as an utopian vision. They are not utopian, in the depreciatory "pie-in-the-sky" use of the word. They are merely a longer-range and more holistic view of the functions of the U.S. food system. "Utopian" or "unrealistic" are names myopia-afflicted specialists apply to anything beyond the four feet in front of them or next quarter's profit margin. To avoid the pitfalls of resource depletion, environmental degradation, economic collapse, and eventual hunger, we need to do better than we have been doing. In today's world, there is nothing more unrealistic or romantic than the belief that all will be well if we look only at the short range.

The following goals are all inter-related and partially over-lapping. In total, they describe the food system behavior that The Cornucopia Project sees as most beneficial to the sustained vigor of the United States and its people -- as well as those who depend on American food.

The Goals of the U.S. Food System Should Be:

1. ABUNDANCE: The food system should give every person access to adequate food -- in quantity, quality and degree of choice.
2. DEPENDABILITY: The food system should provide every person with a reliable food supply — free from social, political, economic, or environmental disruption.
3. SUSTAINABILITY: The food system should be culturally, environmentally, economically, and technologically sustainable in respect to production and all other aspects of the food system -- including resource inputs, cultivation techniques, processing and distribution.
4. SAFETY: The food system should not endanger workers, consumers or the environment.

5. EFFICIENCY: The food system should incur minimal energy or other resource costs.

6. APPROPRIATENESS: The food system should be matched to both the limits and needs of its region and locality.

7. EQUITABILITY: The food system's benefits should be available for use by all in a fair manner.

8. WEALTH: The food system should generate sufficient income to rural people to provide a standard of living equivalent to that of other sectors of the economy to maintain vigorous rural communities and to enable farmers to fulfill their land stewardship responsibilities.

9. FLEXIBILITY: The food system should be open to change, growth, evolution, creativity and experimentation.

10. OPENNESS: The food system's organization, patterns of control and course towards the future should be within public view.

The current food system in the U.S. is not near those goals, and for the most part, not even heading in these directions. We need to re-think and re-establish what it is we want from our food system, and then proceed down the path that will take us toward our explicitly stated goals. Our goals are offered in the hope of opening and furthering a dialogue on where the U.S. food system should be heading.

How do we get from where we are to where we want to be? What paths exist for us to travel on? What new options could be and should be developed? What can we do in order to bring about a transition to a more sustainable, self-reliant food system with its accompanying economic and nutritional benefits? The next section seeks to answer these questions.

2. The Cornucopia Agenda: Finding the Path to Food Security

Developing a secure, affordable, and ecologically sustainable food supply will not be easy or simple. The U.S. food system is touched by so many factors: everything from the California food producer, fast-food restaurant, grocery store, food broker and warehouser to the backyard garden and family dinner table. It is affected by everything from federal, state and city government policies to business decisions to neighborhood and consumer organizations to individual actions.

Any thoughtful response to food system problems has to be on a variety of different levels. There are responses needed from agri-industry, from farmers, from the community, and from individuals. In addition, there are things we need to do immediately, and longer-range actions and emergency preparedness plans that must be developed. Nevertheless, The Cornucopia Project's research points out some relatively clear-cut paths that will lead us in the direction of our goals.

We have organized these paths or recommendations around the participants who need to carry them out: farmers, who produce our food; consumers, who are the foundation of the entire food system and who have the most power to change it; the food industry, which processes and distributes our food, and which has enormous powers for improving our food system in relatively short order; the cities, who would be hit hardest by any food crisis; the states, who have the power to do many of the things necessary for a secure food supply; and the nation, which has the overall power to coordinate the national dimensions of the food system, to enact the policies needed by the entire country, and to formulate sustainable relationships with the rest of the world.

The path The Cornucopia Project sees as leading the U.S. farmer to increasing economic success and strengthening the entire food system, has the following dimensions:

Recommendations - Farmers

1. REDUCE DEBT

Farmers can begin to gain liquity in their business by reducing debt to manageable levels. Indebtedness is a cause of the vulnerability in today's farm operations. Many farmers are over a million dollars in debt; a 500 acre farm easily costs that much in today's inflated economy. A million dollars at 13 percent interest (if a farmer's lucky to get that low rate) is $130,000 annual interest, or about $356 a day. Such a farm is under a heavier cash flow burden than a 200 acre farm that's paid for.

Heavily indebted farmers are trapped into a spiraling complex of paying high interest costs, needing more acreage to increase cash flow, and relying on a heavy depreciation schedule to offset taxes on the large volume of production. They need to milk every possible cent from the land today with little thought for tomorrow. High depreciation, rather than frugal protection of assets, becomes the goal. Farmer indebtedness is a two-edged sword: if land prices fall precipitously -- and remember there is no such thing in history yet as permanent inflation -- such farmers will be financially wiped out.

2. DIVERSIFY PRODUCTION

Farmers can work toward selected combinations or rotations of crops, thus reducing fertilizer and weed control costs while giving the farm greater market stability. Single cash crop farmers (corn, wheat, hogs) are totally at the mercy of wild economic swings. With a mixture of crops, or even better, a mixture of crops and livestock, farmers would be in a better position to roll with the punches. They might lose money on one or two enterprises, but they will be able to make up for these losses with other crops. This will make them less vulnerable to variations in weather, pests and disease.

Tractor size can be reduced by spreading power requirements over a longer time period. With capital and production input costs increasing far more rapidly than the market value of the produce, diversification to increase the efficiency of those expensive resources is essential.

3. STOP SOIL EROSION

Farmers can become serious about stopping soil erosion. Applying to the local soil conservation district for help in developing or updating a soil and water conservation management program would be a good start. Right now there is more money to be made by mining the soil than by saving it. Out from under the burden of 13 percent interest, and with public policy support for conservation, the farmer could take a slight short term "loss" for a big long term gain. Terraces, shelterbelts, grasslands, farming systems that build soil, and other soil saving stratagems, can become part of the farm plan again, reducing the need for increasingly costly fertilizer inputs.

4. CUT INPUTS

Farmers can use better management practices, such as cropping systems that reduce the need for chemical fertilizers and pesticides. They can minimize or eliminate the use of many expensive inputs and lower operating costs without significantly affecting yields. Through spending less money, they can make more.

5. CHANGE GRADING AND MARKETING STANDARDS

Farmers can begin to work for a change in those grading and marketing standards that are now outmoded. Many states do not yet allow the sale of certified raw milk, a more nutritious and as clean a product as pasteurized milk. The entire meat grading system, which gives incentives to corn-fed meat, needs overhauling. Excellent meat can be raised with a much higher percentage of pasture or roughage in the diet. But right now, this meat won't grade choice. Consequently, it brings a much lower price and provides, in effect, a subsidy for corn-fed meat production.

6. EXPLORE DIRECT MARKETING CHANNELS

Some farmers can sell food directly to the public. That way, they receive a higher price for what they sell, while consumers are often able to buy fresher food at lower cost.

7. DEVELOP ON-FARM ALTERNATIVE ENERGY SOURCES

Farmers can continue to investigate possibilities for using alternative energy sources. Raising oil crops to substitute for diesel fuel may already make economic sense. So might a team of horses in some operations. Some vegetables produced in solar greenhouses now seem economically competitive with vegetables brought in from long distances.

8. DEVELOP ON-FARM FERTILIZER SOURCES

Farmers can start growing much of their own fertilizer again in the form of nitrogen-fixing legumes and green manure crops. They can use crop rotations that reduce the amount of herbicides needed, and biological controls to replace or reduce pesticide use.

9. SELL TO FOOD SERVICE OUTLETS

A large percentage of food is consumed outside the home, at restaurants, schools, and other institutions. Many of these organizations buy food in large quantities, and could become good customers for marketing co-ops formed and operated by farmers. The trend toward salads and other fresh foods will enlarge opportunities for aggressive farmers to produce specifically for food service markets.

The path The Cornucopia Project sees as being the most economical, sustainable and safe for the U.S. food consumer, and which will benefit the whole food system most, has the following aspects:

Recommendations - Consumers

1. INCREASE AWARENESS OF FOOD SYSTEM OPERATION

Consumers can become more aware of where their food originates and what is done to it. Much of our food is transported a great distance; for every two dollars spent on energy to grow food, another dollar is spent on energy to move it around. By reading food labels and talking to grocery store personnel, consumers can learn much about their food.

2. CONSUME MORE FRESH, LOCALLY-GROWN FRUITS AND VEGETABLES

Consumers can purchase fresh, locally-grown fruits and vegetables when these foods are in season, and enjoy foods at the peak of their nutritional value during the time they are least expensive. By buying these foods in bulk and processing them for cold weather months consumers can eliminate the commercial processing and packaging costs that push up food prices.

3. SUPPORT LOCAL FARMERS

Consumers can help to create a more viable local agriculture by buying food directly from growers. By patronizing roadside stands, "pick your own" farms and orchards, and farmers' markets that sell locally-grown food, consumers can assure themselves of tasty, nutrition-packed foods at reasonable prices, while at the same time providing needed financial support to local farmers.

Consumers who live in cities can take advantage of the "support your neighborhood farmer concept" by joining a food co-op or buying club that contracts with farmers in the region. In addition, by buying in large quantities, food costs per unit will be lower, with the savings passed on to the consumer.

4. DEVELOP A PRUDENT DIET

Consumers can begin to gradually modify their diets to include less fat, salt, sugar, and cholestrol, and include more fiber and vegetable protein. According to the U.S. Dietary Goals, fat should be reduced from 40 to 30 percent of caloric intake, with saturated fat accounting for no more than 10 percent. Sugar should be reduced to 15 percent of calorie intake, salt use should be reduced to 3 grams per day, and cholesterol intake to 300 mg. per day. Carbohydrate consumption should be increased to 55 to 60 percent of caloric intake.[1]

5. GROW MORE FOOD

Consumers can grow their own fruits and vegetables. Already, 34 million American home gardeners produce some of their food.[2] Intensive gardening techniques could greatly expand the contribution from home gardens. When planning a garden, one possible strategy is to join with neighbors and plant some unusual fruits and vegetables. Then, by sharing this harvest, all will have a greater selection of food. In addition, this cooperation lays the groundwork for other activities, such as neighborhood canning and food storage.

6. PROCESS AND PRESERVE MORE FOOD

Consumers can process and preserve some of their -- or the local farmer's -- summer bounty by canning, freezing or drying their produce. By putting up their own food, consumers can control cooking and processing times, and the type and amounts of additives (if any) being used. Such foods will be of higher nutritional value than those bought in the supermarket, and they will also be cheaper.

7. EXTEND THE GROWING SEASON

Consumers can build solar grow frames or small greenhouses to extend their growing season. Grow frames are inexpensive, small structures that use the sun's heat and light so cool weather vegetables and salad greens can thrive even in mid-winter. During the coldest months, it is possible for a family to have a daily salad of fresh greens harvested from a grow frame. A greenhouse needs more space and is more costly to build, but it offers the consumer a wider selection of crops and a larger harvest.

8. PRODUCE MEAT OR FISH

Consumers can try raising backyard animals like rabbits, chickens, or fish. Chickens and rabbits take-up little space, are efficient converters of feed into meat, and their manures can be used as garden fertilizer. Fish gardening in a backyard or basement pool can provide a family with up to 100 pounds of fish a single growing season. Fish are excellent converters of food into protein, and these quiet, odorless creatures are a good choice for growing in suburban areas.

The path The Cornucopia Project sees as leading the U.S. food industry to increased economic viability, and strengthening the entire food system, has the following dimensions:

Recommendations - Food Industry

1. ENCOURAGE SUSTAINABLE FARMING METHODS

The food industry — companies that process, distribute, and market food -- can encourage the use of more sustainable farming methods. Food companies can influence what farmers grow and how they grow it, as well as what is available in food stores and how much that food costs.

Processors could urge growers to use fewer chemicals, to minimize soil destruction, and even to grow more diversified crops. Food companies could give preferential treatment to farmers who follow such practices. Food waste could be cut considerably if the industry would de-emphasize the cosmetic aspects of produce, and focus on freshness and taste rather than uniform size and shape. Companies that can adapt to the changing realities affecting our system will increase their own chances for future success.

2. MINIMIZE ENERGY AND MATERIAL USE

The food industry can conserve energy and materials in several ways. Processing and packaging food, for example, use as much energy as all the farms that grow our food. Processing food less, and using simpler packaging, could cut energy and material use substantially. Additional savings could be made if distributors reversed the current trend toward truck transport, and made more use of railroads and piggyback transport, which are at least three times as energy efficient per ton/mile.

Incentives for the nation's railroads will also be needed so that their interstate capabilities can rise to meet increased demand. The results would not only be a saving of energy and money, but also the creation of a food system less vulnerable to disruption from an energy crisis.

3. REGIONALIZE FOOD PURCHASING, PROCESSING AND DISTRIBUTION

The food industry can work to regionalize operations. Many large companies process food in a few, very large plants, which increases the distance that food must be moved -- both to and from the factory. By building new, more energy-efficient, smaller plants in farming areas or close to metropolitan areas where much of the food will be consumed, the food industry will save energy and money as well as help the local economy, farmer and consumer. And by decentralizing the purchasing of raw materials as much as possible, long distance shipping will be reduced and costs lowered.

4. PROMOTE CONSUMPTION OF FRESH, LOCALLY-PRODUCED FOOD

The food industry can de-emphasize advertising which features highly processed food with limited nutritional value, and promote locally-produced, fresh food in season. By encouraging consumption of this food, stores can not only enhance consumer nutrition, but the local economy as well.

5. WORK COOPERATIVELY WITH CONSUMERS

The food industry can stop seeing consumers as enemies. At present, consumers often feel food companies are solely concerned with selling products and making huge profits at their expense, while industry leaders tend to fear "radical consumer activists." Instead, the two groups should recognize their mutual dependence and work together. Consumers must recognize that food companies need to make a profit to exist, while the industry should realize that the goal of consumers is not to harass food companies, but to insure that they can buy good food at reasonable prices.

6. PROVIDE ADDITIONAL FOOD-RELATED SERVICES

The food industry can increase efforts to provide information to consumers, rather than merely trying to sell products. Stores that offer services beyond well-stocked shelves, such as nutrition education, hints for food preparation, and instructions for preserving fruits and vegetables, will stand out from their competition.

7. DEVELOP NEEDED NEW PRODUCTS

The food industry can develop new products that are in tune with a sustainable system, and that anticipate consumer needs and preferences in years to come. Products should fill an actual need, with emphasis on minimal packaging, less processing, and good nutritional value.

8. SEE FOOD IN A BROADER CONTEXT

The food industry cannot be just another business. Food does more than fuel people. Food nourishes life. People are recognizing more and more that what they eat affects their health and happiness. A growing number of people see diet as an essential component of a healthy life, and as a way to both treat and prevent illness. Over the past few years, consumers have substantially altered their diet for health reasons, and that trend is likely to continue. Companies that see food in a holistic way are likely to prosper.

The path The Cornucopia Project sees as leading urban areas to a secure, economical and sustainable food supply, and as strengthening the entire U.S. food system, has the following dimensions:

Recommendations - Cities

1. ESTABLISH A DEPARTMENT OF FOOD

Cities can establish, as part of their government, a "Department of Food" that is responsible for aiding and encouraging local food production and distribution. This department would:

a. Regulate land use;

b. Encourage urban and rural food production;

c. Develop urban markets for local produce;

d. Coordinate waste recovery efforts;

e. Initiate educational programs; and

f. Develop plans for meeting local needs -- both normal and emergency — through local production and storage.

Such departments would make urban food supplies more secure, and increase local food availability.

2. PRESERVE FARMLAND

Cities can preserve the remaining farmland in their vicinity by:

a. Establishing land-use management committees to make policy recommendations dealing with urban growth while preserving farmland (or encouraging their zoning committees to do likewise).

b. Facilitating the establishment of urban block farms that include housing units with areas set aside for farming, greenhouses, food storage, food preservation, recycling, etc.

c. Creating "Agricultural Open Space Preserves" within their boundaries that preserve remaining prime farmland for agricultural use.

The more farmland that is preserved, the greater the potential for local food production.

3. DEVELOP AND ENCOURAGE LOCAL FOOD PRODUCTION

Cities can decrease their food supply vulnerability and lower the cost of their food by:

a. Making publicly-owned lands that are suitable for food production available for community gardens.

b. Providing local tax incentives for home/community produced food.

c. Establishing Urban Agricultural testing programs with the state Cooperative Extension Service to test crop varieties, analyze soil for nutrients and pollutants, test crops for pollutant residues, prepare demonstration sites for various types of urban agriculture and waste recycling and offer technical assistance on farming as well as design and construction of community greenhouses, cold frames, rooftop gardens, etc.

d. Facilitating long-term leasing of vacant lots to community groups for urban gardening and providing basic site improvement.

e. Establishing city-run gardens for low income individuals receiving food stamps to supplement their food allotment or providing seeds, access to land, tools and technical assistance as part of food stamp benefits.

f. Subsidizing gardens, or giving start-up funds to establish gardens and/or greenhouses, in schools, prisons, hospitals and nursing homes.

g. Developing loan funds for food self-reliance projects such as greenhouses, food preservation and storage operations, and small businesses associated with urban agriculture.

h. Establishing community farms on their urban fringes to be worked by local farmers.

i. Encouraging city agencies, as well as consumer groups, senior citizen and day care centers, hospitals, schools and prisons to purchase food directly from local farmers and processers.

j. Promoting contract growing (as practiced in Japan) whereby groups of urban families, or co-ops, or even the city itself, arranges to buy food directly from a local supplier.

k. Encouraging local industries which produce waste heat to make use of this energy by constructing greenhouses.

1. Establishing large-scale composting operations (such as the Bronx Frontier Development Corporation compost project in New York City) to turn vegetable, manure and other organic wastes into compost for urban gardens.

4. DEVELOP AND ENCOURAGE LOCAL MARKETS

Cities can increase the security and economy of their food supply and develop and encourage local markets by:

a. Encouraging and assisting the establishment of farmers' markets in the city, particularly in low-income neighborhoods, and facilitating authorizations for farmers to accept food stamps at the markets.

b. Helping establish mobile farmers' markets and/or fish markets to visit housing projects, neighborhood centers, apartment complexes and factories.

c. Assisting in the formation of buying clubs, food cooperatives, co-op stores and preservation/storage centers.

d. Providing incentives for supermarkets to remain in inner cities.

5. DEVELOP AND ENCOURAGE LOCAL FOOD PROCESSING AND STORAGE

Cities can increase the security of their food supply and develop and encourage local food processing and storage by:

a. Sponsoring community canning facilities where residents can preserve food inexpensively or free of charge.

b. Providing incentives to grocery stores to establish canning facilities for their shoppers.

6. FACILITATE ACCESS TO FOOD

Cities can insure that all segments of their population have a supply of food by:

a. Facilitating access to food stamps, emergency food outlets, and elderly feeding programs for those in need of these services.

b. Providing transportation to farmers' markets and "pick-your-own" operations.

c. Establishing a "Food and Hunger Hotline," (as is in operation in New York City) to provide referrals for emergency food, food stamps, elderly feeding sites, etc.

7. EDUCATE PEOPLE ABOUT THEIR FOOD SITUATION

Cities can increase the public's understanding of the food situation in the U.S., their state and city, and help people shop more economically by:

a. Organizing public meetings and/or educational programs explaining the importance of agriculture to urban areas, as well as offering classes in urban agriculture, aquaculture, container and rooftop gardening, food preservation, storage, and preparation, and nutrition. Wise food selection based on locally-produced foods should be taught in all classes.

b. Encouraging public schools to include classes on local/urban agriculture.

The path The Cornucopia Project sees as leading the individual states to a secure, sustainable and economical food supply, and as strengthening the entire U.S. food system, has the following dimensions:

Recommendations - States

1. REGIONALIZE THEIR FOOD SUPPLY

States can regionalize their food supply or increase their degree of self-reliance in basic food stuffs by taking steps to promote agricultural production within their own state boundaries, and in adjacent or nearby states by:

a. Diversifying production within their state by, for example, providing technical assistance from extension agents, and low-interest state-guaranteed loans for the changes necessary for diversification.
b. Mandating a study by each State Department of Agriculture and the state land grant university of the potential for producing the various crops needed in the state.

c. Establishing demonstration experiments to test crop, animal, and fish varieties suited to the state's soil and climate, and develop and test low input, sustainable farming techniques suitable to the state.

d. Providing incentives for farmers to diversify.

e. Providing tax incentives for small-scale food producers -- such as not taxing the first $10,000 of income from food produced for local consumption.

f. Issuing state tax credits for home production, processing and storing of food.

g. Developing incentives to enter farming, such as guaranteed state loans with deferred or reduced payment until 5 years after start-up (as currently being done in Minnesota). States could also provide technical, managerial and organizational assistance for new farmers.

These efforts would not only strengthen the local food supply, they would enhance the local economy as well.

2. EXPAND LOCAL MARKETS

States can help expand markets to assure farmers of local outlets for their products by:

a. Establishing more farmers markets, especially in urban areas, and setting-up wholesale farmers markets, to supply retailers, consumer co-ops and other volume purchasers.

b. Giving preference to in-state producers in bidding for the sale of foods to state-run institutions.

c. Assisting farmers in establishing producer co-ops to facilitate bulk buying of supplies and services by volume purchasers.

d. Providing incentives for farmers to operate roadside stands and "pick-your-own" operations.

e. Establishing "good samaritan" laws whereby farmers are not held responsible for claims arising from the "gleaning" (clean-up of fields after machines or professional pickers have finished) of their fields.

f. Facilitating and promoting direct purchase of food from farmers by supermarkets, schools, hospitals, day care centers, senior citizen centers, company cafeterias, restaurants, etc.

g. Encouraging and providing assistance to processing plants that purchase local products.

h. Providing assistance to small growers through a statewide marketing clearinghouse.

i. Beginning or enhancing promotional campaigns (with specific logo to identify state-produced foods) to heighten awareness of the importance of local agriculture to the economy of the state and its residents.

3. PRESERVE FARMLAND

States can stop the loss of their farmland and protect their production potential by:

a. Instituting (or accelerating) the computerized mapping of farmland that is to be protected from development (as California has done).

b. Implementing modifications of farmland tax assessments to reflect current use value rather than potential market value.

c. Instituting programs for "Purchase of Development Rights," whereby a farmer who sells his development rights is paid the difference between the value of his acreage for development and its value for agriculture, thus keeping the land available for crops (as is being done in Suffolk County, New York).

d. Designating that class I and II lands be used for agricultural purposes only.[3]

e. Levying heavy taxes on profits made on the development of previously prime agricultural land.

f. Establishing agricultural districts (as is being done in New York) to protect farmland from urban expansion.

g. Acting to prevent "leapfrog" or random development, which forces farmers to pay a disproportionate share of the new tax burden as urbanization creeps towards their farms.

h. Developing a procedure that allows the state "first refusal" rights to agricultural land being sold (as is done in France).

i. Providing tax incentives for farmers who voluntarily restrict development of their prime agricultural lands.

j. Instituting a farmland capital gains tax high enough to remove prime agricultural land from speculative markets.

4. STOP EROSION

States can stop or reverse the loss of their topsoil by:

a. Enforcing existing anti-erosion laws.

b. Establishing new penalties for erosion damage such as prohibiting all agricultural production activities which result in more than five tons of soil loss per acre per year -- the maximum rate at which the soil's fertility can be maintained. And establishing rewards for soil enrichment, such as tax credits for on-farm soil and water conservation programs, including contour tillage, minimum tillage, and crop rotation.

c. Instituting and enforcing laws that require a conservation plan for all agricultural lands in excess of 25 acres.

d. Linking economic programs -- such as loans, crop insurance, disaster relief, and state purchase of farm commodities -- to avoidance of excessive soil erosion.

e. Instituting and enforcing a "severance tax" on soil losses due to excessive erosion. Tax revenues from farms permitting rapid erosion could be used to finance subsidies to encourage conservation practices, and to pay for down-stream dredging of silt, damage to water treatment facilities and other social costs.

f. Using public subsidies, such as low interest loans, preferential farm property tax formulas and valuations and other tax incentives to encourage regional organic waste recycling, cover and permanent cropping, minimum tillage, ridge planting, proper rotation, longer rotations, biological nitrogen fixation, contour plowing, terracing, stripcropping, leaving harvest residues on soil surfaces, reducing soil compaction and salinity, and intercropping.

g. Developing incentives for encouraging the use of rental arrangements which include provisions for sharing erosion control and soil enrichment costs with landowner.

h. Developing public awareness programs to promote understanding of the need to support sound soil conservation practices.

i. Using performance contracts which tax farmers on their average tons of soil lost per acre per year.

Taking these actions would result in a drastic reduction in soil loss. According to the USDA, practicing just minimum tillage techniques on 80 percent of all U.S. cropland would reduce soil erosion by 50 percent or more.[4] In fact, the USDA reports that "the organic matter content of some soils has actually increased by 12 to 25 percent after 5 to 10 years of no-till cropping where tillage was previously done with a mold board plow."[5] The use of all available conservation techniques would not only stop the trend towards soil oblivion but reverse it. In parts of Europe, Japan and China, soil quality is better now than it was thousands of years ago when farming first began.

Imposing soil loss restrictions would not add appreciably to the cost of food. One study found that cutting Iowa's soil loss 75 to 90 percent would only increase the per-capita cost of producing food and fiber by about 4 percent.[6] In addition, reservoir siltation and dredging costs would decrease, and the savings could finance many soil enrichment programs. Pollution from fertilizer and pesticide runoff would also be greatly reduced.

By stopping soil erosion, and conserving and enriching the soils,

-- the U.S. would clean its streams, rivers, and lakes of their largest pollutants,

-- drastically reduce toxic run-offs,

-- reduce dredging costs,

-- expand reservoir longevity,

-- maintain and increase farm productivity,

-- decrease wind blown soil damage,

-- reduce inflation caused by the need for ever more higher-priced fertilizers and pesticides to maintain soil productivity,

-- cut on-farm energy use by making soils lighter and easier to plow,

-- improve soil fertility,

-- reduce drought damage by improving soil structure and water-holding capacity, and,

-- increase the esthetic beauty of the entire landscape.

The annual U.S. soil loss cost of $6 to 54 billion could be greatly reduced, and possibly reversed. By building up our soils instead of washing them down the river, we will be building equity. Topsoils that don't wash away in 1982 will add to crop yields in 1983. Policies are needed that translate this long-term equity into short-term dollar gain so that the farmer is financially rewarded for soil enrichment (and other sustainable agricultural techniques), not punished as he is in today's short-sighted economic accounting system.

5. DEVELOP ON-FARM RENEWABLE ENERGY SOURCES

States can encourage food producers and processors to switch from depletable to non-depletable types of energy, freeing them from the threat of shortages and escalating prices of these inputs, and creating a more stable, adaptive, and anti-inflationary food system. Decreasing the overall demand for oil will improve the U.S.'s balance-of-payments situation, and minimize the environmental impact of present day energy-intensive practices.

In the next 10 years, the U.S. food system will spend at least $400 billion just for the non-renewable fuels to provide us with food.[6] This figure does not include increases caused by inflation, or price jumps due to international factors or increases in demand. With such items, the figure could easily be doubled.

To switch the energy base of the U.S. food system from non-renewable to renewable energy will be expensive, but to continue to run the food system almost entirely on fossil fuels as we are now doing will be even more expensive. For example, to produce the amount of energy currently consumed by the U.S. food system with present solar energy technology would cost about $500 billion.[7] But once the system was switched over to renewable energy, the annual costs for fuel would be greatly reduced, and the annual costs for imported oil (a major driving force behind inflation) would be eliminated.

States can help bring about a transition from depletable to renewable energy sources by:

a. Conducting regional inventories of all renewable energy sources.

b. Providing incentives, such as tax credits for investments made in agricultural energy conservation and on-site development of renewable energy sources; or low-interest loans for accomplishing the same; or tax exemptions for income received from the production of renewable energy.

c. Setting up pilot projects and demonstration sites using alternative forms of energy for various types of farms, and showing recycling and the use of sludge.

6. CONSERVE WATER

States can help insure that they will have water for farming, industry, commerce and consumers by:

a. Pricing water to more accurately reflect its actual costs. For example, farmers in the Central Valley in California pay $3.50 an acre-foot for their irrigation water. Without subsidies, the cost of this water would be $1,100 per acre-foot. And if aquifers become exhausted, the price would be astronomical.

b. Eliminating the use of declining block rate structures, whereby the largest user of water gets changed the lowest rate. Instead, flat-rates, inclining block rates, where the heaviest users have the highest rates, or seasonal rates can be instituted.

c. Providing investment incentives for drip irrigation and other water conservation equipment.

7. RECYCLE ORGANIC WASTES

States can increase the efficiency of their food system by:

a. Preparing a state-wide inventory of the types and amounts of organic wastes available now and in the future and assess the ability of these wastes to improve soil fertility and tilth.

b. Establishing an Agricultural Waste Council in their State Department of Agriculture to develop desirable legislation and other measures to facilitate recycling of wastes.

c. Developing incentives for using local organic wastes for fertilizer and incentives to industry to separate toxic substances from their wastes so that it might be more safely used on cropland.

d. Setting up pilot projects and demonstration sites for recycling and the use of sludge.

8. DEVELOP IN-STATE FOOD PROCESSING

States can stop the loss of their food processing industries and improve processing capabilities by:

a. Providing incentives for existing food companies to develop more energy-efficient processing and packaging techniques, along with incentives to attract new food processors who wish to reduce transportation costs by locating near a major distribution center. Developing a food processing industry which meets the needs of producers and consumers within the local economy will enhance the entire state economy.

b. Providing incentives for on-farm processing, cooling and fresh packing of local food crops.

c. Helping establish community food processing and storage facilities for the use of families and small commercial food producers. In this way, economies in equipment and energy consumption can be realized.

d. Developing incentives for expanding their livestock slaughtering and storage facilities.

9. DEVELOP LONG-RANGE FOOD SYSTEM PLANS

States can begin to deal with the growing complexities and vulnerabilities of their food supply by:

a. Developing an overall state food policy which will increase regional self-reliance and economic viability while decreasing the vulnerability of the state's food supply.

b. Developing an emergency food plan to deal with a food supply disruption. This might provide for regional grain storage facilities and the formation of state-wide communication and coordination centers.

c. Conducting an annual study of the condition of the state food system that will illustrate the amount of food currently being imported and exported, the amount of land lost to development, soil erosion losses, and what measures need to be taken to increase the state's self-reliance.

10. INITIATE EDUCATION PROGRAMS

States can help farmers, consumers, cities, and food industry leaders be aware of the options available to them by:

a. Developing consumer education programs to increase awareness of locally grown produce.

b. Initiating educational programs on farmland preservation, farm energy conservation, reduced pesticide and fertilizer use, recycling of organic wastes, and energy expenditures in different methods of farming and home food production and preparation.

c. Promoting nutrition education campaigns to illustrate the relationships between diet and health, and the benefits of fresh, seasonal, locally-grown and minimally processed foods, as well as bulk purchasing of food.

d. Communicating the goals and the condition of the state's food system as revealed in their annual study. (See 9.c.)

11. REVITALIZE FISHING INDUSTRY

States can help in revitalizing their fishing industry by:

a. Developing more direct marketing systems, including inland market options for surpluses.

b. Participating with other states and the Federal Government in keeping annual harvests below best estimates of maximum sustainable yield for all species.

c. Enacting and enforcing stricter laws regulating dumping of pollutants in marine waters.

d. Providing investment incentives for aquaculture within the state.

12. ENHANCE CONSUMER AND ENVIRONMENTAL SAFETY

States can protect their citizens and their natural environment by:

a. Strictly enforcing existing environmental protection laws.

b. Developing programs for safer handling of toxic pesticides and stronger enforcement of laws against pesticide misuse -- such as spray drift and farmworker exposure to newly sprayed fields.

c. Developing stricter standards for pesticide residues in foods.

The path The Cornucopia Project sees as leading the entire United States to a secure, economical, and sustainable food system, and as enhancing the welfare of all the world's people, has the following dimensions:

Recommendations - Federal Level

1. ELIMINATE SUBSIDIES TO NON-SUSTAINABLE AGRICULTURE

U.S. tax laws and other subsidies can be changed to favor sustainable agriculture by:

a. Eliminating well-water depletion allowances that encourage pumping water at rates which exhaust the underlying aquifer.

b. Eliminating tax laws that encourage the purchase of new, larger, and more expensive farm machinery, thereby pushing the farmer deeper in debt and increasing soil compaction.

c. Eliminating tax laws that encourage the accumulation of huge debts.

d. Eliminating tax laws that encourage land speculation and absentee ownership of farmland. With present-day arrangements, favorable taxes and steadily rising land prices encourage individuals and businesses to buy farmland as an investment and hedge against inflation rather than as a primary means of earning a livelihood.

e. Eliminating the export of subsidized grain, or grain sold below production cost.

f. Eliminating or vastly reducing research and development funds for non-sustainable agriculture.

g. Modifying Agricultural Stabilization and Conservation Service regulations for cost-sharing programs so that farmers who use organic techniques can participate. Currently, in order to qualify for certain tillage, seed, lime and permanent pasture programs, farmers must apply particular commercial fertilizers based on mandatory soil test results. This commercial fertilizer requirement should be changed so that equivalent organic fertilizers may be substituted.

h. Modifying current USDA commodity stabilization programs that regulate cropland acreage to establish a category of cropland called "voluntarily diverted cropland" that would recognize any land that the farmer converts from crops to grass or trees. If this land were recognized as a part of the farmer's cropland base, when commodity circumstances call for reduced planting of certain crops, farmers would not be penalized for seeking to conserve their soils (as they are now).

i. Removing all production subsidies to tobacco, a proven carcinogen.

2. DEVELOP A LONG RANGE NATIONAL FOOD PLAN

The U.S. can develop a comprehensive food plan. Many of the problems plaguing our food system result from the lack of an explicit long-range food plan. The question of where the food system should be in 20 years is not addressed in any meaningful sense. Crop projections for the next year are the usual time horizon for much of what happens with the U.S. food production system. We need to do better. Goals and strategies for reaching a sustainable food system need to be developed and explicitly stated.

3. DEVELOP REGIONAL FOOD SYSTEMS

The U.S. can work toward a regional food system. Every region (every group of states, each state, and subregions within each state) has a unique climate, geology, soil, demography, economy, resource base and culture. Each has its own particular food needs. By encouraging different regions to become more self-reliant and self-sufficient in food production,

-- the whole national system can become more stable and adaptable,

-- energy use can be cut back through decreased transportation,

-- costs can be reduced because of lower transportation and processing needs,

-- more fresh and nutritional food can be consumed,

-- local waste can be recycled onto farmlands, reducing synthetic fertilizer needs and increasing soil health,

-- more jobs can be created in the region, and

-- the local economy can become more stable and vital.

Regionalization is not a step backwards in time to a period when the U.S. actually was a series of self-sufficient and self-reliant groups of regions, but rather is a step forward into the vastly more complex world of the future. It is a way of learning from the past, like the use of modern wind turbines by

U.S. utilities to generate electricity. Increased regional self-reliance is not a call for decreasing adaptability, or a return to an over-romanticized bygone era, but rather an effort to increase each region's capability to provide for its own needs.

Just as America's older industries need to be revitalized and "reindustrialized", to make them more efficient and in tune with present economic realities, America's oldest industry -- the food system -- needs to be regenerated into a more efficient and sustainable system. The technology that allowed the development of the vast global inter-linkages that are the hallmark of today's food system need to be "miniaturized" and made appropriate for local regions. The know-how that makes it possible for "inexpensive" California lettuce to be sold in New York needs to be applied to the production and sale of even less-expensive New York lettuce. And what food must be shipped long distances -- possibly wheat, bananas, citrus fruits, etc. -- needs to be moved more efficiently.

The Federal government can help increase regional food self-reliance by:

a. Developing a federal food policy that facilitates state, city, consumer, farmer and industry programs for dealing with soil and land conservation, energy conservation, regional food systems, and sustainable agriculture. Part of the overall food policy can be an emergency plan to deal with a disruption in national food supply.

b. Providing funds for the development of regional and state food system inventories and "firstcut" transitional plans to more self-reliant state food systems.

c. Decentralizing certain parts of the U.S. Department of Agriculture. By giving each state Department of Agriculture more control over its land grant universities, research funds, extension agents, loan funds, soil conservation service, etc. the individual states will be better equipped to develop a regional and sustainable food system tailored to their unique needs.

d. Giving preference to local producers for Federal food purchases for the armed forces, hospitals, offices, schools, etc. This could save about $4 billion per year in transportation costs for U.S. taxpayers.[8a]

e. Eliminating or reducing federal subsidies for long distance food transportation. For example, trucks do not pay their share of highway maintenance. This amounts to a subsidy to the trucking of food across the country. If trucks had to pay for the damage they do to the nation's highways, long distance transport of food would be very expensive.

   One way of reducing the subsidy to long distance food shipment would be to add the hidden costs, currently borne by U.S. taxpayers, directly to the cost of gasoline and diesel fuel in the form of an additional federal tax. This type of arrangement would charge all transportation costs directly to transportation users.

   At present, only 65 percent of highway maintenance and construction costs are charged directly to users. A $10.8 billion annual government subsidy covers the remainder of the costs. If this subsidy was allocated to the 125 billion gallons of transportation fuel consumed annually, it would result in an increase of $.09 per gallon.

   Economic losses due to highway accidents could also be allocated in the same way. These losses total over $56.4 billion annually. If collected through a gasoline tax, they would add an additional $.45 to the cost of each gallon of gasoline.

   In addition, about one-half of all air pollution in this country is from road vehicles. Thus, $275 million (one-half of the $543 million spent each year for air quality control programs) could be added to the cost of gasoline. Together, these three hidden costs would add $.55 to the price of each gallon of gasoline, an increase close to 50 percent in fuel costs.[9]

f. Placing limits on the amount of price support or payments which any one farmer can receive. That would help reverse the trend toward fewer and larger farms. Current commodity support programs reward landowners rather than farmers.

4. STOP SOIL EROSION AND PRESERVE FARMLAND

The federal government can emphasize that the privileges of land ownership are balanced by obligations and responsibilities. These include not only preventing one's land from eroding or preserving its nutrients, but also include the notion that land owners/trustees have an obligation to do something useful with their land; that social benefits flow from good land use and social costs result from idle or neglected land.[10]

The United States can act forcefully to reverse the loss of its topsoil and farmland by:

a. Declaring its remaining topsoil and farmland a national trust.

b. Developing strong incentives to reverse soil erosion, such as linking price support, loan guarantee and owner and operator loans to participation in soil conservation programs.

c. Developing Federal land-use policy guidelines that help local governments find ways to stop development of prime farmland.

d. Restricting Federal funding for development on prime farmland or using prime farmland only as a last resort in any Federal construction projects.

e. Using performance contracts which tax farmers on their average ton of soil loss per acre per year.

f. Not recognizing as cropland any new lands that do not meet the criteria for Capability Classes I through IV, and making programs such as crop insurance and disaster relief unavailable on lands that do not qualify as Class IV or better unless the farmer can demonstrate that he has applied an effective conservation system onto the land. Federal programs need to stop subsidizing the cultivation of unsuited soils because the public gets stuck with paying three bills: the cost of the subsidy itself, the unfair competition this subsidized farmer has over the unsubsidized farmer, and the topsoil loss, water and air pollution, and related costs of soil erosion.

g. Recognizing or certifying farmers who are initiating, managing and maintaining conservation systems on their land. Each farmer that carried out a satisfactory conservation program would earn a "Green Ticket" that could be used to apply for special benefits under USDA's farm programs -- such as reduced crop insurance premiums, and lower interest rates on loans from Farmers Home Administration and private lending institutions -- since the conservation system provides assurance of continued levels of productivity.

Measured against the $6 to 52 billion annual loss of U.S. topsoil, the cost of these programs would more than justify themselves. It can be argued that we lose more dollars in soil loss each year than the $10 billion the United States has spent on erosion control programs since it began allocating money back in 1935.[11] Given the annual costs of soil loss, much greater expenditures are warranted.

5. FUND SUSTAINABLE FOOD SYSTEM RESEARCH

Federal research and development efforts can explore more effective and economical ways to make the switch from our present system of food production and distribution to sustainable systems by funding research in such areas as soil fertility, crop production, animal production, and transitional agriculture. Such research could help by:

a. Determining the impact on soil life and growth of different cultivation and rotation methods, including no-till, intercropping and monoculture, and different materials such as compost humates, seaweed, dolomitic lime, synthetic or acidulated fertilizers, seed and soil inoculants, acid rain, herbicides and pesticides.

b. Studying the effects of rotations and tillage practices on weed shifts, the effects of plant combinations and densities on pest management, and the holistic interactions of various cropping systems according to climatic zone, farm size, and type of farm.

c. Developing procedures to reduce antibiotic and chemical use to control animal disease.

d. Determining transition rotations for small and large farms, comparing abrupt transitions to gradual changes, and finding ways for "cleansing" soil of toxic substances.

(For details in this area see The Cornucopia Project's report, "Research Agenda for the Transition to a Sustainable Agriculture")

6. CHANGE GRADING AND MARKETING STANDARDS

Federal grading and marketing standards can be overhauled to eliminate outmoded incentives or subsidies by:

a. Allowing beef fed with a much higher percentage of grass or roughage to grade choice. (Current practices give a subsidy to the less efficient corn-fed beef.)

b. Modifying USDA marketing orders so that nutritional content of fruit and vegetables -- and not just cosmetic appearance -- is an indicator of product quality.

c. Requiring labels for all products to list the origin of that product. In this way, consumers will be able to know which products are from their locality.

7. FACILITATE LOCAL FOOD SYSTEMS

The federal government can facilitate the development of local food systems and increase national security and local economic viability by:

a. Providing federal tax incentives for home food production, including greenhouse and growframe construction.

b. Developing widespread home and urban gardening extension services to assist the 34 million American households with gardens.

8. HELP ELIMINATE GLOBAL FOOD INSECURITY

The United States can protect its citizens, help eliminate hunger, malnutrition and famine, reduce the growing disparity between the rich and poor countries, help stabilize international relations and provide the foundation for a durable peace by:

a. Establishing or participating in an international grain reserve for famine relief.

b. Helping food-short countries increase their self-reliance by providing appropriate technical and financial support in such areas as intensive, small-scale, sustainable food production, and local food storage.

c. Stopping the sale to foreign countries of pesticides banned or restricted in the United States. This will protect agricultural workers in these countries as well as stop the export of pesticide-poisoned crops to the United States by these same countries, with the resulting poisoning of U.S. citizens as well as citizens of other nations.

d. Participating in global efforts to protect fish stocks.

e. Stopping the export of the United States' limited supply of the strategically important phosphate fertilizer.

f. Instituting a 10 percent surcharge/tax on grain sold to developed countries as a means of financing an international grain reserve and paying for U.S. soil conservation efforts.

g. Decreasing our imports of forest products, thereby helping to preserve vital forests in developing parts of the world.

h. Increasing "user fees" paid by government-subsidized foreign fishing fleets in U.S. waters, thereby helping to insure a sustainable harvest.

SUMMARY

Recommendations - Farmers

1. REDUCE DEBT
2. DIVERSIFY PRODUCTION ENTERPRISE
3. STOP SOIL EROSION
4. EXPERIMENT WITH PERMANENT AGRICULTURE
5. CHANGE GRADING AND MARKETING STANDARDS
6. EXPLORE DIRECT RETAIL SALES
7. DEVELOP ON-FARM ALTERNATIVE ENERGY SOURCES
8. DEVELOP ON-FARM FERTILIZER SOURCES
9. SELL TO FOODSERVICE MARKETS

Recommendations - Consumers

1. INCREASE FOOD SYSTEM AWARENESS AND INVOLVEMENT
2. CONSUME FRESH, LOCALLY-GROWN FRUITS AND VEGETABLES
3. SUPPORT LOCAL FARMERS
4. GROW MORE
5. PROCESS AND PRESERVE MORE
6. EXTEND GROWING-SEASON
7. PRODUCE MEAT OR FISH
8. DEVELOP PRUDENT DIET

Recommendations - Food Industry

1. ENCOURAGE SUSTAINABLE FARMING METHODS
2. MINIMIZE ENERGY AND MATERIAL USE
3. REGIONALIZE FOOD PURCHASING, PROCESSING AND DISTRIBUTION
4. PROMOTE FRESH, LOCALLY-PRODUCED FOOD
5. WORK COOPERATIVELY WITH CONSUMERS
6. PROVIDE ADDITIONAL FOOD-RELATED SERVICES

7. DEVELOP NEEDED NEW PRODUCTS
8. SEE FOOD IN BROADER CONTEXT

Recommendations - Cities

1. ESTABLISH DEPARTMENT OF FOOD
2. PRESERVE FARMLAND
3. DEVELOP AND ENCOURAGE LOCAL FOOD PRODUCTION
4. DEVELOP AND ENCOURAGE LOCAL MARKETS
5. DEVELOP AND ENCOURAGE LOCAL FOOD PROCESSING AND STORAGE
6. FACILITATE ACCESS TO FOOD
7. EDUCATE POPULATION ABOUT FOOD SITUATION

Recommendations - States

1. REGIONALIZE THEIR FOOD SUPPLY
2. EXPAND LOCAL MARKETS
3. PRESERVE FARMLAND
4. STOP EROSION
5. DEVELOP ON-FARM RENEWABLE ENERGY SOURCES
6. CONSERVE WATER
7. RECYCLE ORGANIC WASTES
8. DEVELOP IN-STATE FOOD PROCESSING
9. DEVELOP LONG-RANGE FOOD SYSTEM PLANS
10. INITIATE EDUCATION PROGRAMS
11. REVITALIZE FISHING INDUSTRY
12. ENHANCE CONSUMER AND ENVIRONMENTAL SAFETY

Recommendations - Federal Level

1. ELIMINATE SUBSIDIES TO NON-SUSTAINABLE AGRICULTURE
2. DEVELOP LONG-RANGE NATIONAL FOOD PLAN
3. DEVELOP REGIONAL FOOD SYSTEMS

4. STOP SOIL EROSION AND PRESERVE FARMLAND
5. FUND SUSTAINABLE FOOD SYSTEM RESEARCH
6. CHANGE GRADING AND MARKETING STANDARDS
7. FACILITATE LOCAL FOOD SYSTEMS
8. HELP ELIMINATE GLOBAL FOOD INSECURITY

3. Summary/Conclusions

The preceding lists of recommendations are not easy reading. They will be harder to implement, but trying to pick up the pieces after a food system crash would be even harder, if not impossible.

Our recommendations should be viewed as a flexible agenda rather than a rigid program. They are what we know today. Tomorrow, as we learn more, we can revise our assessments of the problems and our options. We hope that part of our learning process will come from you, in the form of feedback on what you've read in this report.

It is vital that we all realize we have the option to change our food system. But it is just as important that we begin to exercise that option today.

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    population = 62,000,000

    Per capita consumption of food per year = 1,463 lbs. (*Agricultural Statistics, 1980*, P.554)

    (62 x 10^6) x 1,463 = 90,706,000,000 lbs. food consumed.
    90,706,000,000 x 80% (amount of food imported) = 72,564,800 lbs.
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    1,395,476,923 ÷ 40,000 = 34,886 trucks per week

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Notes: Land Use/Soil Abuse

1. Assuming that 160 tons of topsoil will cover one acre to a depth of 1 inch, 5.8 billion tons of topsoil will cover 36,250,000 acres with acres with one inch of topsoil. Total cropland for Maine, New Hampshire Vermont, Massachusetts, Connecticut, Rhode Island, New York, New Jersey, Pennsylvania, Delaware, Maryland, Alabama, Arizona, California and Florida = 35,989,000 acres (USDA Soil Conservation Service, Basic Statistics 1977 National Resources Inventory, rev. 1980, table 3, p. 3).

There are 34,900 supermarkets in the United States, each having an average area of 20,000 sq. ft. (Food Marketing Institute, Information Services, Washington, D.C.) 34,900 x 20,000 = 6.98 x 10^{8} total sq. ft. for all supermarkets. 5.8 billion tons of topsoil ÷ 160 (tons/acre/inch) = 36,250,000 acres/inch. 36,250,000 x 43,560 (sq. ft./acre) = 1.5791 x 10^{12} sq. ft./inch (1.5791 x 10^{12}) ÷ (6.98 x 10^{8}) = 2.26 x 10^{3} inches topsoil/supermarket. (2.26 x 10^{3}) ÷ 12 (inches/foot = 188 ft.

2. 5.8 billion tons of topsoil are lost to erosion annually. At 960 tons of top soil per acre, 6 inches deep, this equals the productive equivalent of 6,000,000 acres.

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25. Frances Moore Lappe, et al. Food First, pp. 31-34, 127.

26. Presidential Commission on World Hunger, Overcoming World Hunger: The Challenge Ahead (Washington, D.C., 1980) p. 222.

27. Frances Moore Lappe Statement Before the House Agriculture Committee. p. 8.

28. Ann Crittenden, p. D6.

29. Ibid.

30. U.S., Department of Agriculture, A Time to Choose, p. 82.

31. Testimony of Jack Doyle (Washington Representative for the Environmental Policy Center) Before the Subcommittee on Conservation, Credit and Rural Development of The Committee on Agriculture, U.S. House of Representatives, "Agricultural Resources Issues and The 1981 Farm Bill," March 12, 1981, p. 2.

32. National Agricultural Lands Study Executive Summary Final Report 1981 (Washington, D.C.: National Agricultural Lands Study, 1981), p. 1.

33. Frances Moore Lappe Statement Before The House Agricultural Committee, pp. 33-34.

Notes: Goals of the U.S. Food System

1. Eating in America, Dietary Goals for the United States (Cambridge: The MIT Press, 1977), p. 12.

2. 1980-81 National Gardening Survey, conducted by the Gallup Organization, Inc. (Burlington: Gardens for All, Inc., 1980), p. 15.

3. There are eight land capability classes that are used to determine a land's ability to grow crops. They range from Class I land, which is best for growing crops, and requires few conservation practices, to Class VIII land which is unsuitable for commercial crop production. Of the 4 classes suitable for cropland (I through IV) all but I require careful management and conservation practices.

4. L.J. Carter, "Soil Erosion: The Problem Persists Despite Billions Spent On It," Science, 22 April 1977, p. 409.

5. U.S. Department of Agriculture, Report and Recommendations on Organic Farming (Washington, D.C.: Government Printing Office, 1980), p. 31.

6. "Our Thinning Soil," Land Resource Use and Protection, Report No. 38 (Ames: Iowa State University, 1975), p. 5.

7. U.S. Department of Agriculture, 1979 Handbook of Agricultural Charts (Washington, D.C.: Government Printing Office, 1979), p. 34.

8. This figure was based on providing the U.S. food system with 12 x 10^{15} BTUs (3.4 x 10^{12} kwh) of energy in the form of electricity--the most expensive form of energy. Photovoltaics at .5c per peak watt operating 40% of the year were used to figure costs.

8a. In 1981 the U.S. Government spent $85 billion on food. (Personal communication, Daniel Wilson, Office of Federal Procurement, Office of Management and Budget, Washington, D.C.) The Department of Agriculture conservatively estimates that 5.3 percent of the retail cost of food is for transportation, (U.S. Department of Agriculture, 1980 Handbook of Agricultural Charts, Agricultural Handbook No. 574 (Washington, D.C.: Government Printing Office, 1980), p. 39.)
$85 billion x .053 = $4.5 billion

9. U.S. Department of Commerce, Bureau of the Census, Statistical Abstract of the United States 1980 (Washington, D.C.: Government Printing Office, 1980), pp. 215, 217, 642, 645, 646, 647.

   a. Total receipts from highways = $34,927 million. Total imposts on users = $22,532 million.
   22,352 ÷ 34,927 = .639 or 64% charged to users.

   b. $10.8 billion (government contracts awarded) ÷ 125.1 billion gallons (fuel used in transportation) = $.09 per gallon.

c. $56.4 billion (economic loss due to highway accidents) ÷ 125.1 billion gallons = $.45 per gallon.

d. Pollutant emissions from road vehicles make up half of all air pollutant emissions, therefore, half of the $543 million spent on air pollution control is for road vehicle emissions. 543 ÷ 2 = $227 million ÷ 125.1 billion gallons = $.01 per gallon.

10. R. Neil Sampson, "The Ethical Dimension of Farmland Protection," _Farmland, Food and the Future_ (Ankeny: Soil Conservation Society of America, 1979), p. 97.

11. U.S. Department of Commerce, Bureau of the Census, _Historical Statistics of the United States_ (Washington, D.C.: Government Printing Office, 1975), p. 487.

U.S. Department of Agriculture, _Agricultural Statistics, 1980_ (Washington, D.C.: Government Printing Office, 1980), p. 520.

APPENDIX

Fifth in a series.

24,000 tons of broccoli.

To many people, broccoli is a vegetable with a funny name.

To New Yorkers, it's a vegetable with a price tag that's no joke.

And for you, wherever you live, the story of how broccoli got to be so expensive provides one often-forgotten reason why your food bills are so high. It may even help you to lower them.

Last year, New York area residents bought about 24,000 tons of broccoli — almost all of it from the West Coast, 2,700 miles away.

It cost nearly $6 million to move that one vegetable across the country. More than 950,000 gallons of fossil fuel were consumed in the shipping process. And, besides the impact on price of this transcontinental journey, consider what must have happened to the broccoli's "fresh-picked" flavor along the route.

Yet, this trip wasn't necessary:

Broccoli prefers cool weather. Except for southern Florida, it could have been grown successfully — and delivered to New Yorkers less expensively — from virtually anywhere else in the continental U.S. Including New York's own backyard gardens.

A special case? Not at all. There are literally dozens of fruits and vegetables that could be — and should be — grown closer to the people who will consume them.

Sometimes, of course, long-distance food shipments are unavoidable. Oranges won't grow in North Dakota; apples don't thrive in southern Florida.

But those few exceptions can't explain why, today, for every two dollars we spend in the U.S. to grow food, we spend another dollar to move it around. Not just to New York. To Massachusetts, which imports more than 80 percent of its food. And to every other section of the country.

It's a crazy-quilt pattern of unplanned food-growing and unrealistic distribution which cannot continue much longer. Our economy will be unable to survive the expense. Our energy resources will be unable to supply the demand.

Clearly, the nation's food system must be re-examined, and then reorganized. In fundamental ways. And without delay.

That's why Rodale Press recently launched *The Cornucopia Project*, which, as far as we know, is the first attempt by a non-governmental organization to make a systematic study of America's food system.

Because of our deep interest in health and nutrition, we're trying to help people — as individuals and in small groups — to understand more about what's happening today on the nation's farms, in its supermarkets, at its dinner tables. And then to do something about it.

The first step in this venture is to assemble information about every aspect of the nation's food system — and how it affects you. Just a small sample of the information we've already gathered is represented by what you've been reading in this message.

If you'd like more —
without charge —
please write:
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Rodale Press,
33 E. Minor St.,
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Sixth in a series.

The losing of America.

The United States will lose 26 square miles of its land today.

It will lose another 26 square miles tomorrow, and every day this year.

But not to a foreign power.

We are giving up our land to the ravenous demands of an unrealistic food system. And, before you turn the page, telling youself that land loss is someone else's problem — too remote, too big for you — *it isn't.*

You *can* help to face this dilemma. And help yourself, too.

If you know these facts:

Each time an Iowa farmer grows one pound of corn for you and us, he uses up five to six pounds of topsoil. And in the wheatlands, for each pound harvested, up to 20 pounds of soil disappear — never again to be available for growing food.

In 1980 — and again in 1981 — three million acres of farmlands will be lost to erosion. Five billion tons of topsoil are displaced annually — enough to cover all five boroughs of New York City with a 13½-foot-deep layer of soil.

And while this is going on, each year, another three million acres of agricultural land are lost to development: new homes, factories, and other structures.

Let's concede those three million acres to the requirements of "progress."

But why is it that, in the areas still being farmed, we're eating up more land than food?

Because today's food producers are "burning up" the soil with chemicals in order to maintain high yields. Because, when they over-use chemicals, the soil becomes more vulnerable to wind and water erosion. Because the ways of commerce are now overruling the wisdom of crop rotation. And because modern tractors don't permit the strip cropping and contour plowing that are most effective for preventing erosion.

Man-made blights, these. Symptoms of a food system that is dangerously out of touch with our new world of limited resources. A food system that is headed for disaster, unless we do something about it.

That's not easy to believe. Not with our bumper harvests almost every year, and our grain-clogged warehouses.

But the danger signals are inescapable: We have already lost half of our land. Each day, the U.S. population increases by 5,000 people while the farmlands shrink. And prices soar, because the food system needs more and more expensive energy to operate.

Is there still time? We believe there is.

America *can* produce food at less cost to the consumer, and to the environment. The nation's citizens *don't* have to pay for food today with fertile soil they'll need tomorrow.

That's why we launched *The Cornucopia Project* — a concentrated effort to collect information about the ways the U.S. food system must be restructured to prevent a food crisis.

The information we've already assembled could be of great importance to you, personally, and we'd be pleased to share it. No cost or obligation, of course. Just write:

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Seventh in a series.

Join our conspiracy.

A loaf of bread costs $7.66.

Tomatoes, three large ones, $5.24.

A ten-ounce jar of instant coffee comes to $45.06.

Is this merely the shopping list of a paranoid housewife trapped in a frantic nightmare? Not at all.

Based on a recent report to the White House, those are some of the food prices you may be paying at the end of the century.

But if you believe only inflation is to blame, think about this:

Each day of the coming decades, there will be 5,000 new people to feed in the U.S. And the food they'll need will have to be grown on less and less land, because six million acres of agricultural land are being lost annually —half to developers, half to the ravages of erosion and irresponsible agricultural practices.

Soon, with mathematical certainty, the growing number of consumers will converge with a declining farmland base — and America can then expect periodic food crises.

Prices will skyrocket. Shortages will be a fact of life. And our food system will cease to be a major source of America's strength.

An overly pessimistic scenario?

Hard to take seriously as you shop in the supermarkets packed with an amazing variety and quantity of food?

Look closer. You will see sobering evidence of the system's irrationality.

We need energy. Yet we waste immense amounts of it, year after year, by continuing to grow fruits, vegetables, and other foods thousands of miles away from the people who will consume them.

We need farmers. Yet, along with our farmlands, our farmers are disappearing. Back in the 1930's, 40 percent of all Americans lived and worked on farms; now, only three percent.

And, of the 32,000 food-manufacturing firms in this country, 75 percent of all their profits is reaped by just 50 of them. With each passing year, power over our food system passes into fewer hands.

Observing this, some people think they detect a conspiracy to control production, distribution, and prices.

We see, instead, too many people ignoring the danger signals. So, we propose a "people's conspiracy" which we call *The Cornucopia Project.*

Quite simply, *The Cornucopia Project* aims to help people — as individuals and in small groups — to understand more about what's happening today on the nation's farms, in its supermarkets, at its dinner tables. And then to do something about it.

To this end, we've already assembled information which we will be glad to share with anyone who is ready to join our conspiracy.

There are no dues. No membership obligations. We're just looking for people who want to stop the waste of soil, food, and energy that is threatening America.

If that's you, we have facts that can be important to you. Please write: Robert Rodale, Rodale Press, 33 E. Minor St., Emmaus, PA 18049.

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Twelfth in a series.

How to export boomerangs.

If our headline has the antic flavor of a Russell Baker Op-Ed piece, no wit is intended.

Rather, a warning.

Because, this message is about lethal pesticides that have been banned by the U.S. Government—yet are still finding their way into your morning coffee. Into the bananas you serve to your youngsters. And the flowers you send home on Mother's Day.

These pesticides include DDT, kepone, aldrin, and dieldrin. Each, according to the Environmental Protection Agency, poses an unreasonable threat to human health. And the sales and use of all are prohibited or severely limited inside the U.S.

But not outside the U.S.

Today, virtually every giant of America's chemical industry is dumping toxic pesticides on Third World nations. In the next decade, experts indicate, these companies will probably double their sales abroad.

There is nothing illegal about this. In fact, a provision of U.S. law — the Federal Insecticide, Fungicide, and Rodenticide Act — explicitly permits the export of banned pesticides.

But few Third World countries have pesticide regulations to protect their citizens. As a consequence, native farmers and workers — uninformed about these new hazards from an alien culture — are suffering devastating harm.

Every minute of every day, we are told by the World Health Organization of the United Nations, someone in the Third World is poisoned by a pesticide.

And if that threat — however regrettable — seems at least comfortably remote from you and your loved ones, consider these facts:

Nearly half of the green coffee beans imported into this country are contaminated with U.S.-banned pesticides bought from U.S. companies.

And sporadic border checks indicate that at least 10 per cent of all our imported food is contaminated by illegally high levels of pesticides.

How much food *do* we import? More than you may think. Last year, America spent $10 billion to buy 600 different food commodities from 150 other nations — many of them users of unregistered pesticides.

No one — not even the Food & Drug Administration — knows for sure how many of these foods contained harmful residues. There are many foods the FDA does not even monitor for potential hazards.

Indeed, the FDA allows food to be marketed before it is tested for illegal residues. According to one Government report, half of the imported food found by the FDA to be adulterated during a 15-month period was marketed with no penalty to the importer. And consumed by an unsuspecting American public.

For that public, we've prepared a special booklet on this critical subject, which we'll be glad to send you. No charge, of course. Just ask for the "Boomerang" booklet. And write to:

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Seventeenth in a series.

Help write a new law.

A new farm law.

Yes, we know you're a city dweller. Or perhaps a suburbanite.

And when it comes to understanding about grain reserves, price supports, or agricultural research, your residence might as well be on another planet.

But there is a crucial piece of legislation, the 1981 Farm Bill, now coming up for Congressional consideration.

It is being discussed by lobbyists.

Shaped by members and staff of key committees in Congress.

And, for the most part, ignored by the rest of us.

This is typical of what happens, each year after a Presidential election, when a new farm bill is introduced.

The results of this quadrennial exercise usually speak eloquently for the legislative skills of the farm interests, in the short run. But, too often, they serve no one's long term interests.

Not the farmers'. And least of all, those of metropolitan consumers.

For example, soil conservation has received scant attention from policymakers over the years. As a consequence, so much of our farmland topsoil will have eroded by the end of this century, that severe food shortages are inescapable.

When that day comes, our own inflation-battered food prices will look positively benign by comparison with what we will have to face.

Longtime farm policy has also armed government advisers with toxic chemicals in their war against insects, disease, and weeds. But it's you — still contending with pesticide residues in your food — who are caught in the crossfire.

And there's little doubt that past farm bills have speeded the trend toward bigger and fewer farms, despite studies showing that the largest farms are not the most efficient.

Is the situation hopeless, then?

Not at all.

Here and there, a few farm-policy victories have been registered recently — enough to give hope that there can be more.

For instance, policy directives in the 1977 Farm Bill, favoring farm-to-consumer market development, brought rich dividends nationwide:

In Colorado, among other places, farmers' market shoppers paid an average of 28 percent less for fresh food.

Farmers, too, benefited. They earned 44 percent higher returns than if they had sold their produce through normal wholesale channels. And farm-ripened melons, beans, and tomatoes reached places such as New York City in unusual plenty.

Other farm bills have been helpful in setting, and then supporting, critically important research goals. The improved farming systems flowing from these initiatives have doubled and tripled many grain yields.

What about the 1981 Farm Bill?

How good — or bad — will it be?

That depends, in part, on how many of us come to realize that a farm bill is not simply legislation for those U.S. citizens who happen to live in Iowa or Nebraska.

The 1981 bill can affect the cost, quality, variety, purity — indeed, even the flavor — of the food you will be eating in 1982. So, we hope you will take an active role in making this legislation as good as it can be.

And, to help you get involved, we've prepared a brief leaflet titled, *Guide to Farm Bill Issues for City People*, which we'll be glad to send you.

No charge, of course.

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Twenty-first in a series.

A state of emergency.

The state is Pennsylvania.

And the emergency is one we didn't fully comprehend until we took a close look at the dangerous vulnerability of Pennsylvania's food system.

You too should take a close look, even if you live elsewhere, because your state's food system probably is even more vulnerable.

Pennsylvania, after all, is the leading agricultural state in the northeast.

It has over 61,000 farms; employs more than 900,000 people in its agribusiness; and leads the U.S. in the production of mushrooms, sausage, pretzels, potato chips, scrapple, and quality-graded eggs.

It also ranks near the top in production of milk, cottage cheese, peaches, grapes, ice cream, wine, and maple syrup.

Impressive, yes. But not nearly enough.

Pennsylvania currently must import over 70 percent of its food.

More than 6,500 truckloads roll into the state each week to supply consumers with 99 percent of their lettuce, 96 percent of their broccoli, 88 percent of their carrots, 66 percent of their beef, and 76 percent of their strawberries.

And unless something changes — quickly — the citizens of Pennsylvania will soon face an unpleasant choice: greater dependency or outright deprivation.

The reasons are clear.

The state is losing its farms: 17 percent in the last decade; over 60 percent since 1950.

The state is also losing its land: Every eight months, developers build on or pave over an area the size of Pittsburgh.

And the topsoil is going fast. Each year, because of erosion, enough soil disappears to cover the entire city of Harrisburg in topsoil to a depth of almost five-and-a-half feet.

Troubling facts, an optimist might reply, but hardly tragic. Just step up the truck traffic from Florida and Arizona and California; those fertile fountainheads have the lavish food supplies to take care of virtually any shortage problem.

Well, maybe.

A study by California's Department of Agriculture points up that state's growing concern about its own burgeoning population and the loss of land to developers.

By the year 2000, it appears probable that California may have little or no food to export.

Even sooner, the supply lines — from California or elsewhere — could be disrupted by drought, crop failure, an oil embargo, or energy shortage.

What would happen then?

A U.S. Department of Energy study, last year, concluded that an energy shortage, or a 10 percent reduction in supplies, would lead to a 55 percent rise in the price of fresh fruits and vegetables.

If word of a severe shortage got out to the public, a "food panic" would likely empty store shelves in less than a day. Even without a panic, the supply of canned goods in larger stores might last for one week; in smaller stores, only a few days.

This is not a theoretical "worst-case scenario." We've already had a taste of what to expect when grocery warehouses were quickly stripped of almost 20 percent of all food items during the last oil shortage.

But calamities of this kind *are* avoidable. Pennsylvania's state of emergency — and your state's, too — can be headed off.

To help you get things started, we've prepared a special report on *The Cornucopia Project's* intensive study of Pennsylvania's food system, including a plan for immediate action.

For your copy —
free, of course — please
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Twenty-third in a series.

Saving America's water.

When Mayor Ed Koch launched his crusade to save water, he enlisted New York City's youngsters.

But, to avoid future water problems across the nation, we would do well to enlist our farmers.

That's because Dad's morning shave and Mom's dishwashing habits have far less impact on water consumption throughout America than they do in New York.

Only about six percent of the country's water resources are used in homes.

About 11 percent goes for industrial or miscellaneous uses.

Agriculture takes all the rest — an astounding 83 percent — much of it for irrigation.

But if the farmers are closer to the water problem than anyone else, they are also closer to the solution. They cannot create water where none exists, of course. But they *can* learn to grow plants that aren't water-guzzlers.

Consider this:

Most of our food today comes from seven plants: wheat, corn, rice, the soybean, the common bean, barley, and the potato — all of which need ample rain. Lacking that, these plants must have irrigation; and this uses up water that, in the future, we'll need for our homes and factories.

Do farmers have to base their crop futures on so few plants that require so much water? No. It's never been necessary. And it's certainly not wise. Especially with so many native plants from dry areas offering a cornucopia of alternatives.

In the Sonoran Desert, for example, Arizona scientists have identified 40 species of wild food plants already being used by residents of the region as food staples.

Several of those Arizona plants produce seeds richer in protein than our common grains. And others produce fruits rich in carbohydrates.

Or, come closer to home. To the Organic Gardening and Farming Research Center, near Maxatawney, PA, where Rodale researchers have been working for eight years to develop an unthirsty plant called amaranth.

The sun-loving amaranth grows waist-high and produces massive seed heads sometimes weighing as much as eight pounds. It is a basic food of American Indians, as well as Aztec and Incan descendants living in remote dry regions. And before long, we expect, you too will be eating amaranth in a wide range of dishes.

In pancakes, cereals, and breads.

In crepes and dumplings and toppings.

Even in snack bars.

It's the good taste of amaranth that has convinced many people of the plant's great potential. Nutritionists are attracted by its high protein content, 15 to 18 percent. And farmers will be interested in our own experience last year: While nearby corn fields withered, our amaranth crop flourished. Without irrigation.

Clearly, this is an ancient crop whose time has come. Again.

And that's good news. For American consumers, and for water-short farmers who must find new ways to produce food — profitably and effectively.

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Twenty-seventh in a series.

Now. A diet that works.

Distance lends enchantment, the poet observed.

And if he hadn't said it almost two hundred years ago, today's vacation-minded city dwellers would say it for him.

But distance — though it's good for the soul and suntan — seldom does any good at all for the food on your dinner table.

Broccoli, which we've mentioned earlier in this series, offers one unhappy example:

Most of the 24,000 tons of broccoli consumed annually in the New York area are transported here from the West Coast, 2,700 miles away. From field to market, the shipment usually takes five to seven days — often as much as two weeks.

Yet refrigerated broccoli loses 19 per cent of its vitamin C in just twenty-four hours, 34 per cent in two days.

Asparagus kept in cold storage loses two-thirds of its vitamin C in a week-long trip to the New York consumer. As well as a considerable portion of its vitamins A and B.

And when spinach has spent a week in cold storage, much of its vitamin C is spent, too — 29 per cent of it.

That's one of the reasons we propose a new diet for *all* of the people of this region — heavy and thin, rich and poor.

We call it *The Local Diet* — a miracle formula that is unequivocally guaranteed to achieve marvelous reductions for the body politic.

To go on this diet, you need only resolve to buy *fresh, local* foods whenever possible — and to adjust your menus to harmonize with seasonal availabilities in your area.

If you follow the diet faithfully — and get your neighbors to join in — you'll begin to see results almost immediately:

First, you'll reduce energy use.

Right now, with our crazy-quilt pattern of unplanned food growing and unrealistic distribution, the nation needs 500 million gallons of fuel yearly to move fresh fruits and vegetables to market. And more than twice that amount — 1,300 million gallons — to move manufactured food products from processors to warehouses and supermarkets.

Next, you'll reduce your vulnerability.

To transportation strikes, to energy crises, and to other unpredictable forces that can suddenly elevate prices and disrupt the normal flow of food into your area. Including, of course, such unfriendly visitors as the Mediterranean fruit fly.

Finally, you'll reduce the severe loss of local revenue that occurs whenever consumers go outside their own area for food supplies.

Estimates indicate that the New York area's dependence on California for broccoli costs our region approximately $85 million each year — money that could remain here if we would grow broccoli here. Similarly, local production of lettuce would save an additional $265 million.

But it's what The Local Diet can *add*, as much as reduce, that makes the most important difference:

Better flavor and more nutrition, often at real savings for the individual.

That's why we urge you to find out what foods are grown near you. Buy them, use them, make them a regular part of your menus.

And we also invite you to write for our free brochure, *The Cornucopia Project*, which gives you a helpful and interesting overview of America's food system — its problems and possibilities, and how they affect you.

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Thirty-first in a series.

A cornucopia for New York.

If you think you're paying too much for celery these days, you're not.

You're paying too much for *transporting* celery — as well as pork, lettuce, peaches, chicken, green peppers, and a huge variety of other food products shipped daily into New York State.

Last year, for example, you and other New Yorkers spent a total of $18 billion to eat.

But you spent only about $17 billion of that on food.

The other $1 billion went for transportation.

That's because New York State imports 77 per cent of its celery, 95 per cent of its pork, 84 per cent of its lettuce, 93 per cent of its peaches, 97 per cent of its chicken, and 87 per cent of its green peppers.

In all, more than 75 per cent of New York's food comes from outside the state — much of it from such faraway points as Florida, the Pacific Northwest, Central America, and California.

Distance is costly: From California, our main source of imported fruits and vegetables, the charges for shipping one truckload of vegetables average $2,400.

What this means to you is an extra six to fifteen cents a pound for your vegetables — and for the mileage.

Yet this trip wasn't necessary.

The cost is largely avoidable.

Because, most of these vegetables could be grown in New York State — if not on a year-round basis, at least over a long enough period to increase our self-sufficiency and decrease our food bills markedly.

Agriculture, after all, is New York's largest industry. The state ranks second in agricultural productivity in the Northeast. So, there is good reason to be optimistic about our chances for increasing production of many foods that are now imported.

But not until we face up to the fact that New York State is losing ground — literally:

Erosion is stealing 45 million tons of our top-soil annually — enough to cover Westchester County with a one-inch layer.

And with the loss of this topsoil, millions of gallons of water storage capacity disappear. As well as more than 250 million pounds of nitrogen and phosphorus, two vital soil nutrients.

Another 81,000 acres are lost each year to highways, high-rises, and other development projects — an area almost equal to that of Brooklyn, Manhattan, and The Bronx combined.

As a consequence, the number of farms in the state has decreased by 28 per cent in the last two decades, and farmlands are down by 19.5 per cent.

Clearly, New York's food system has non-growing pains.

But it also has grand possibilities.

Our new Cornucopia Report measures both, and offers a plan of action that is vitally important to every New Yorker.

We'd be happy to share it with you. No charge, of course. For your copy, please write
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Rodale publishes: *Prevention, Rodale's New Shelter, Organic Gardening, Bicycling, Executive Fitness Newsletter, The New Farm,* and *Spring,* as well as hardcover and paperback books under the Rodale imprint. The company also produces films and television programs.

Thirty-second in a series.

Nurturing the Garden State.

There's a lot of losing going on these days in New Jersey—

Not all of it at the Atlantic City gaming tables.

One thing New Jersey is losing is a firm grip on its title as the Garden State.

The "vegetable basket of the East" is now better known for its refineries, chemical plants, highways, and New York City bedroom communities.

The state that made truck farming a major economic force now imports more than half of its vegetables and 75 per cent of its fruit.

In all, 75 per cent of the food consumed by New Jersey's residents comes from outside the state: 99 per cent of the beef, 86 per cent of the eggs, 74 per cent of the fluid milk and cream, and almost 100 per cent of the poultry.

Inevitably, as all of this food rolls into the state, money flows out.

Last year, New Jerseyites spent only $0.7 billion for locally produced food. They spent more than ten times that amount, $7.3 billion, for imported food. Of this, about 20 per cent stayed with local retailers, and $5.8 billion left the state—a net loss, *each day,* of $15.9 million.

New Jersey's most serious loss, however, isn't money. It's land.

Since 1950, 44 per cent of the state's farmland has vanished.

Much of it has gone to developers. Every two years, an area the size of Newark is lost to high-rises, highways, and shopping centers.

Erosion, too, has claimed a huge amount of nutrient-rich soil: about 5.5 million tons annually, or enough to cover the city of Trenton with a layer more than seven inches deep.

But, as readers of these messages know, New Jersey's plight is not unique. New York, Pennsylvania, and virtually all other states in the Northeast face the same problem. Or soon will.

What is different in New Jersey—and merits the attention of everyone in this area—is what's being done there.

Local groups of farmers, business executives, and private citizens met several years ago to take a realistic look at what was happening to agriculture in the Garden State, and how it could be improved.

They reported their findings to two State departments, Agriculture and Environmental Protection, which subsequently issued the "Grassroots Report: An Agricultural Retention and Development Program for New Jersey."

Don't be put off by the title. Behind the gobbledygook there is a solid, locally initiated plan rooted in the state's strong commitment to sustain and stimulate New Jersey agriculture.

And now, in November, consumers will have their chance to vote on the Farmland Preservation Bond Act, which calls for the state to issue $50 million in bonds to finance the purchase of easements on farmlands and for water and soil conservation projects.

The cost, admittedly, is high. But New Jersey's voters will have the opportunity to decide whether the cost may not be even higher if farmlands continue to disappear and there must be a growing dependence on costly foods from other states.

It's a problem likely to become more common throughout this section of the U.S. So, our Cornucopia Report on New Jersey, just completed, can be important to you wherever you live.

For a free copy, please write to:

Robert Rodale, The
Cornucopia Project,
Rodale Press,
Emmaus, PA 18049.

RODALE
PRESS, INC.
Emmaus, PA 18049

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Background and Acknowledgements

The primary aim of The Cornucopia Project is to create an accessible body of information about the U.S. food system that can be used by all individuals and groups seeking to understand and improve that system. We feel that our work is unique, and is needed badly. We have not been able to find any other organization, either public or private, which is doing this kind of work. And it is obvious, because of the tremendous complexity of the food system, that holistic analysis of this kind is needed to understand how the elements of the system interact, and what the result of change in the strength of each element is likely to be.

Some Cornucopia Project studies are on a national scale, such as this report. Others examine the food systems of states. So far, we have completed audits of Pennsylvania, Maine, New York, New Jersey and Michigan. Currently underway are studies of California, Arizona, North Carolina, Florida and Illinois. It is our intention to audit the food systems of all 50 states. In addition to these research reports, The Cornucopia Project distributes a free newsletter to over 25,000 people and issues other reports on various aspects of the food system. Research in progress includes county, neighborhood, family, and industry level food system studies.

The Cornucopia Project has grown out of Rodale Press's over 40 year concern about the problems of the U.S. food system. It was, originally, a response to repeated inquiries about the state of the U.S. food system and what should be done about it. Empty Breadbasket?: The Coming Challenge to America's Food Supply and What We Can Do About It is the response to these inquiries.

The Cornucopia Project has a full time staff of seven people plus three to five interns. It is funded almost entirely by Rodale Press. Small amounts of additional funds have come from symposia and publications. Although a for-profit company, Rodale Press has a long history of funding food system research that has no direct payback to the company. Most, if not all, of this somewhat unorthodox business behavior can be attributed to (or blamed on) the vision and social conscience of Robert Rodale, the Chairman of the Board of this family owned company.

This document, from its inception, has been a group effort. It was launched by an eclectic group of fifteen researchers, editors and management personnel at an intensive two-day seminar held in the Fall of 1979 that I facilitated. Out of this seminar grew not only the initial in-house report which is the foundation of Empty Breadbasket?, but the primary impetus and conceptual underpinnings for the entire Cornucopia Project. This group effort was continued by the growing Cornucopia staff. Ellen Pahl, Tom Dybdahl, Jean Polak, Pat Messing, Ray Wirth and I contributed to the research and writing while Tom Dybdahl copy-edited, Brenda Bortz proofread, Jean Polak, Andrea Cesari, Ellen Pahl, and Pat Messing fact-checked. Sue Campbell and Karen Buchecker typed and retyped the entire document at least a dozen times. Sue Campbell also did many of the charts and graphs, Jean Polak managed to see to it that the production operation went smoothly, and was finished on time, Carol Gladys answered the mail, thereby providing everyone with the time to do their tasks, and I provided a modicum of conceptual leadership. In addition to the already mentioned people, the Recommendations section of Empty Breadbasket? benefited from the experience and insights of Robert Rodale, John Haberern, Richard Harwood, George DeVault, Gene Logsdon, Patrick Madden and Sara Ebenreck; and The Cornucopia Project in general received valuable and greatly appreciated feedback in its early formative stages from Wendell Berry, Donnella Meadows, Kenneth Dahlberg, Garth Youngberg and a host of others too numerous to mention. In addition to all these people, three others need special acknowledgement for the pivotal roles they have played in this document and the entire Cornucopia Project. The first of these people is John Haberern, the person in charge of research at Rodale Press, who has helped enormously throughout the project's brief history with his constructive insights and untiring support. The second is Richard Harwood, who directs agricultural research at Rodale Press and whose sagacity and guidance in the early stages of Empty Breadbasket? helped form its ultimate directions. The third person is Robert Rodale, without whose vision, conceptual leadership, enthusiasm and support this document and The Cornucopia Project would not exist.

-Medard Gabel
Director, The Cornucopia Project

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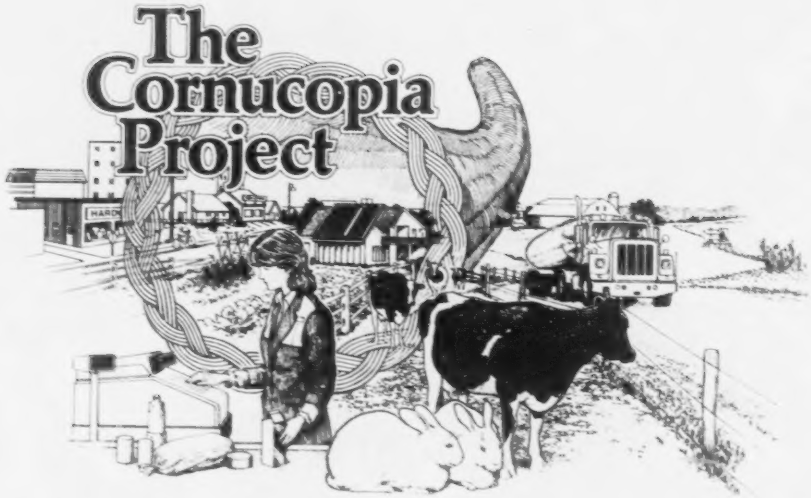

The Cornucopia Project
HARD

THE PENNSYLVANIA FOOD SYSTEM: CRASH OR SELF-RELIANCE?

A study of the food system of Pennsylvania by

The Cornucopia Project of Rodale Press
33 East Minor Street
Emmaus, Pennsylvania 18049
Phone: (215) 967-5171

Introduction

Pennsylvania is the most productive agricultural state in the Northeast. It is blessed with fertile farmlands, abundant forests, huge reserves of coal. Even the name--Penn's Woods--brings to mind the image of a rich, fruitful land.

If that sounds a bit promotional, we make no apology. Pennsylvania is our home, and we like it here. It seemed only natural that when The Cornucopia Project wanted to study the food system of a particular state, we would begin with our own.

As citizens of Pennsylvania, what we discovered about our state's food system has made us deeply concerned.

*Over 70 percent of the food we eat is produced outside the state.

*We spend $8.4 billion every year on food from outside the state; transportation alone costs us over $400 million.

*In the last 30 years, we have lost 61 percent of our farms; in another 30 years we may not have any farms.

*Every year we lose 164 square miles of agricultural land to erosion and development; every 8 months we lose an area the size of Pittsburgh to development; every year we lose enough topsoil to bury Harrisburg under 5½ feet of soil. At this rate, our entire agricultural productivity will be destroyed in about 70 years.

These problems are compounded by the fact that what is happening in Pennsylvania is happening across America. Every day, while the U.S. population grows by 5,000, the nation loses the productive equivalent of 25 square miles of agricultural land to erosion and farmland development. Repeated, heavy applications of chemicals and continuous single-cropping are destroying the fertility of our soil. The supply of fertilizer minerals is rapidly depleting.

Our entire food system is powered by non-renewable fuels. Processing, packaging and transporting food use 60 percent more energy than all the farms that produce our food.[1] Dependence on long-distance food transport makes supplies tenuous in many areas. Farm debts are at record levels and rising astronomically; they've shot up 650 percent in the last 20 years.[2] Irrigated farmlands in the West, which produce a large share of the nation's foodstuffs, are threatened by declining water tables and increasing salt build-up. Last year's drought caused major losses in our corn, soybean, sorghum and peanut crops, and more severe weather patterns are predicted.

Seen in this context, the hard facts about Pennsylvania's food supply lead to an inescapable conclusion: our system is vulnerable. An energy cutback, a transportation strike, a freeze, drought or labor dispute in California--any of these could mean a food crisis. Our method of producing food is wearing away our state's productive capabilities. In earlier times, a food system that consumed resources so heavily seemed to make sense. In today's world, it certainly does not.

But the situation is far from hopeless. Pennsylvania has the resources, both in land and people, to change this dangerous position. We can preserve our farms and farmland, increase our self-reliance, and develop a secure food supply, if we act now. The purpose of this report is to help us begin to do that.

The frightening facts

Pennsylvania's food system is in trouble. The biggest danger is that the situation may become critical before it even seems serious.

That may seem like a strange thing to say about the leading agricultural state in the Northeast. Pennsylvania has over 61,000 farms, and 7.4 million acres of cropland and pasture, of which 4.4 million acres are prime cropland, the most productive type of land in the country.[1,2] Pennsylvania agriculture generates over $2.5 billion in farm receipts, and supports a $20 billion a year agribusiness economy which employs more than 900,000 people.[3] It leads the U.S. in the production of mushrooms, cigar-leaf tobacco, sausage, scrapple, pretzels, potato chips, and quality-graded eggs. It ranks near the top in the production of milk, cottage cheese, ice cream and frozen dairy products, sweet corn, sour cherries, apples, peaches, grapes, grape juice, wine and maple syrup.[2,4]

Despite this abundance, Pennsylvania imports over 70 percent of its food.[5] Every week, more than 6,500 truckloads of food from such distant places as California, Arizona and Florida come rolling into the state to keep us from going hungry.[6] Among these imports are 99 percent of our lettuce, 96 percent of our broccoli, 88 percent of our carrots, 76 percent of our strawberries, 77 percent of our beef, 82 percent of our pork, and 60 percent of our potatoes.

Since most of our food comes from faraway places, that's where our food dollars go. Pennsylvanians spent nearly $12 billion for food in 1980--$1,023 for every child, woman and man in the state.[8] Of this amount, $8.4 billion was paid for food produced outside Pennsylvania.[9] About $18.4 million leaves the state each day to pay for our imported foodstuffs.

But these figures on food imports and dollar exports do not tell the full story. The number of farms in Pennsylvania is decreasing rapidly. Since 1970 we have lost more than 17 percent of our farms; since 1960, over 46 percent; and in the 30 years since 1950, over 60 percent.[10] If this trend continues, in the year 2004 (23 years from now) our children and grandchildren may never know what a real farm looks like.

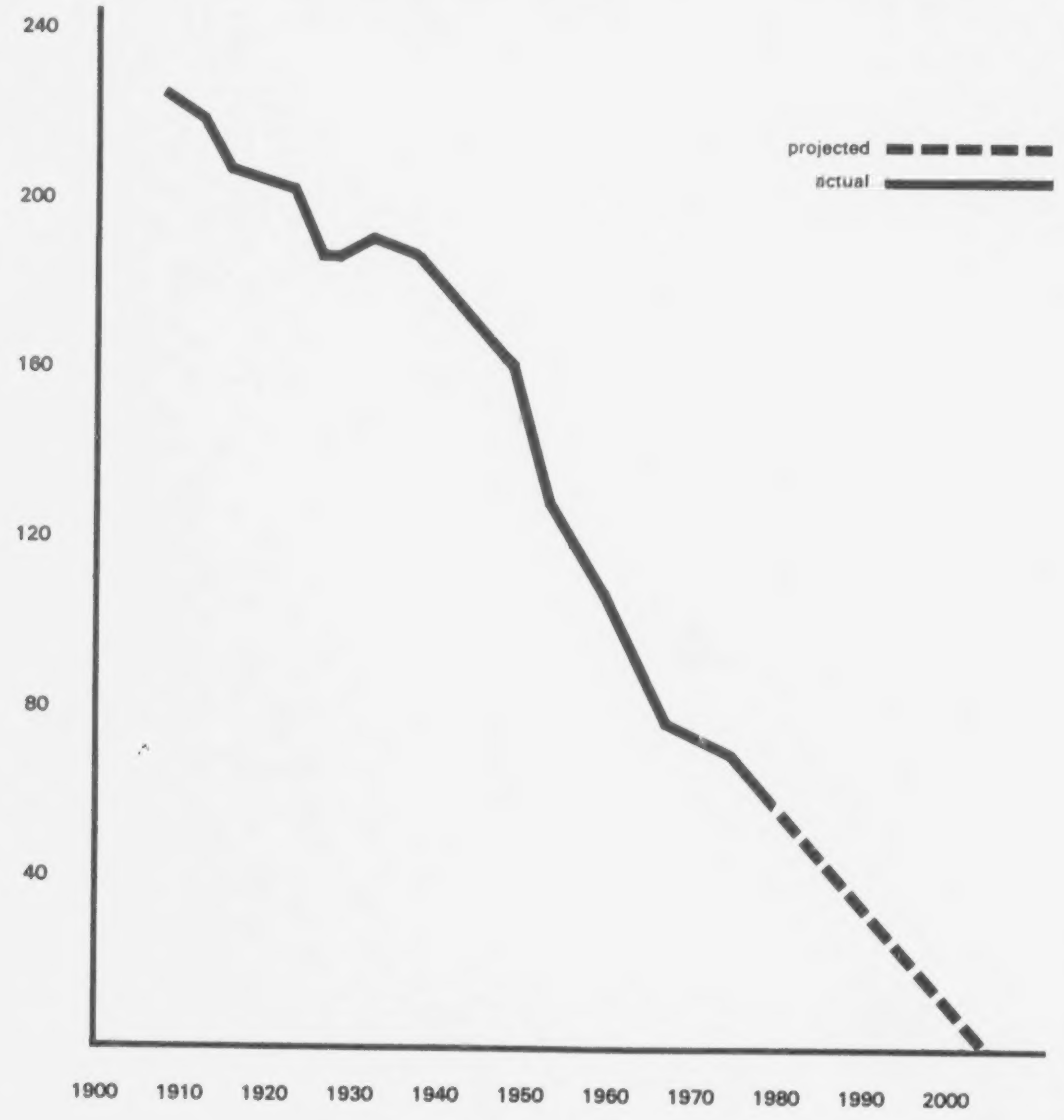
Part of the reason for the decrease in the number of farms is the increase in size. In the last 30 years, the average farm in Pennsylvania has grown by over 60 percent.[10] (See chart 2.) This means that power over our food system is being concentrated in fewer and fewer hands. A system dependent on large farms is less flexible or adaptable in times of stress than one composed of many small farms. And these large farms are less efficient than smaller ones.[11]

A more important reason for the disappearance of our farms is the amount of land lost to development. Each year 81 square miles (52,000 acres)[1] of agricultural land are built on or paved over; an area the size of Pittsburgh is lost every eight months!

Soil erosion is equally destructive to farmland. Pennsylvania annually loses 50.7 million tons of soil to sheet and rill erosion[1]--enough to cover the entire city of Harrisburg with nearly 5½ feet of topsoil each year. Erosion is always troubling, but intensive chemical farming, with continuous planting of row crops and use of heavy equipment that compacts the soil, makes it even worse. Measured in terms of acres lost, the soil eroded in Pennsylvania would come to over 50,000 acres annually.[12]

Taken together, development and erosion cause the loss of about 164 square miles of agricultural productivity in Pennsylvania each year. At this rate, we will lose the state's entire agricultural productivity in a little over 70 years. And if the amount of land being farmed continues to decline as it has since 1950, Pennsylvania will have no farms by the year 2030--a mere 50 years away. (See chart 3.)

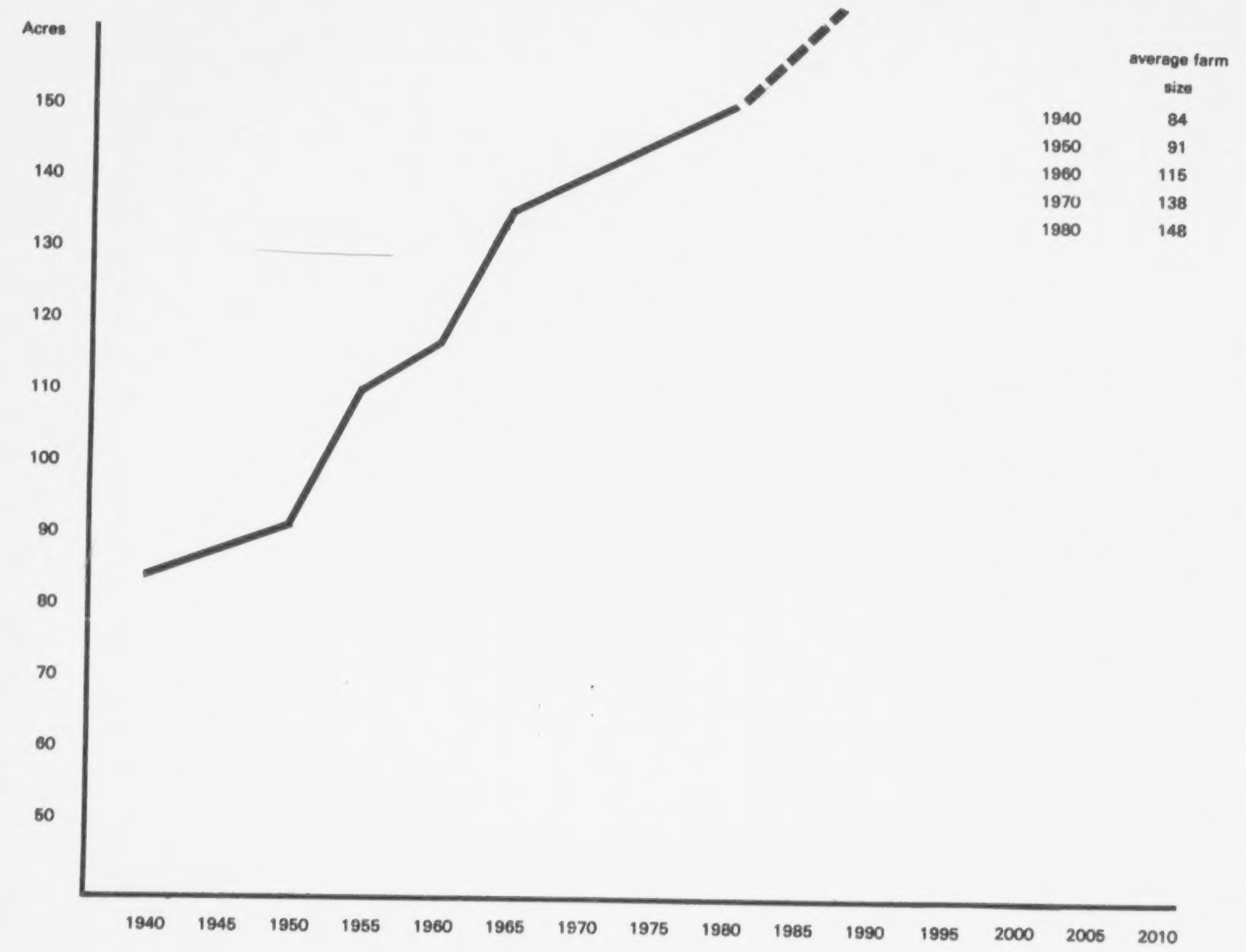
Chart 1 **Number of Farms in Pennsylvania 1900-2000**



Source: Pa. Crop Reporting Service

Chart 2

Average Size of Farms, Pennsylvania 1940-1980

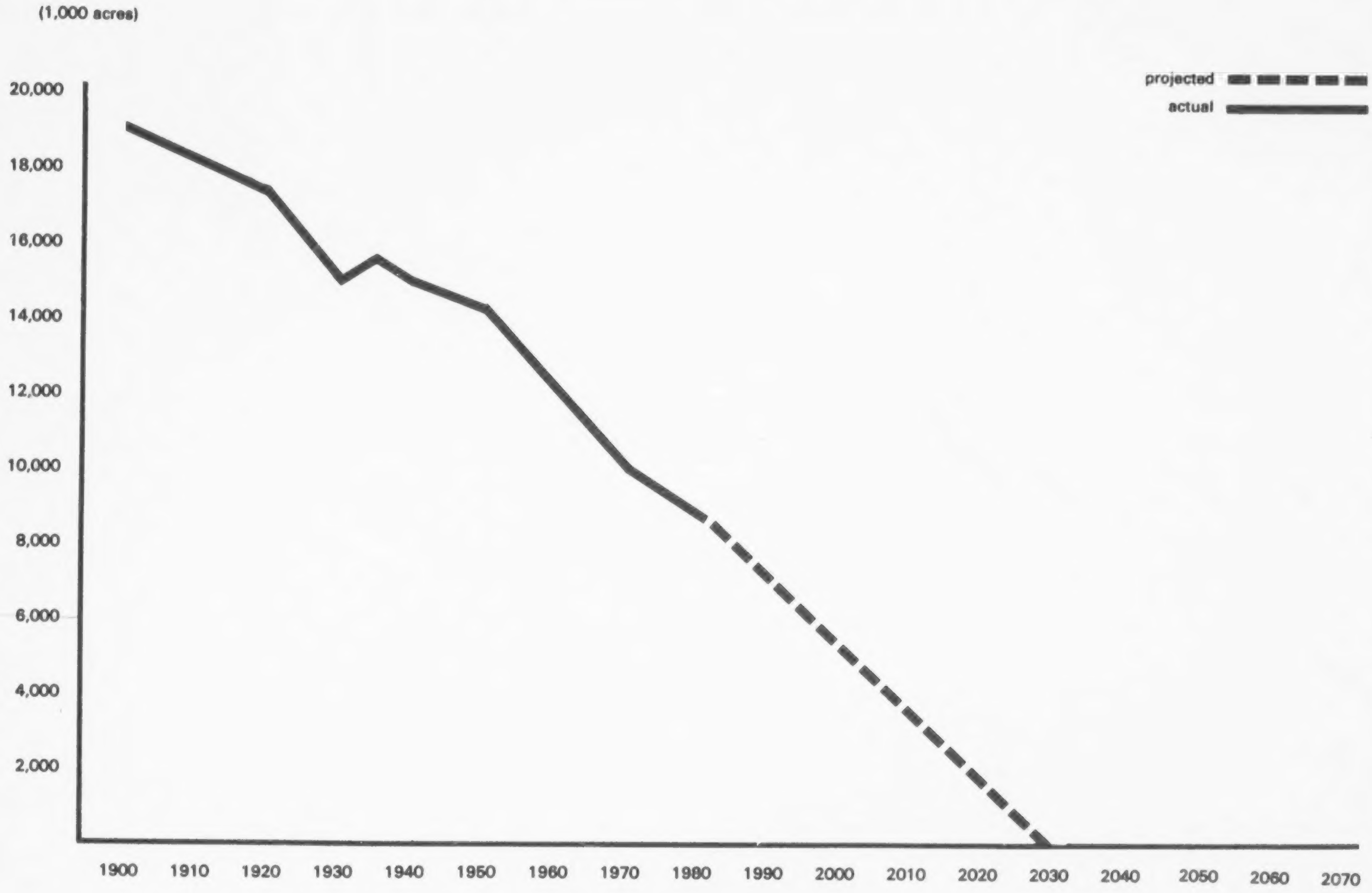


	average farm size
1940	84
1950	91
1960	115
1970	138
1980	148

Source: Pa. Crop Reporting Service

Chart 3

Land in Farms, Pennsylvania 1900-2070



Sources: Historical Statistics of the U.S.
Pa. Crop Reporting Service

Besides endangering our future, this destruction of soil exacts a heavy price in the present. Each foot of eroded soil can store about two inches of water for crops, and an acre-foot contains about 8,000 pounds of nitrogen and 2,000 pounds of phosphorus.[13] So through erosion, Pennsylvania loses nearly 200 million pounds of nitrogen and 52.8 million pounds of phosphorus each year. At current prices, this represents an annual loss of over $75 million in just these fertilizer minerals--about 22 percent of Pennsylvania's fertilizer consumption for 1979. And this does not include the value of the 1.43 billion gallons of water storage capacity lost or the long-term decrease in the productivity of the soil.

What do these facts mean?

This situation represents much more than some unusual numbers. Together, these numbers add up to some disturbing news for anyone in Pennsylvania who eats.

1) Our food supply is vulnerable. Because we depend on outside producers for most of our food, our supply is highly uncertain. An oil embargo or energy shortage, a labor dispute, a drought or crop failure in Florida or California--any of these could lead to serious shortages. A California Department of Agriculture study indicated that "California's enviable position in agricultural productivity has been built upon relatively inexpensive energy inputs and available supplies," and that "most of California's best farmland lies within counties designated as Standard Metropolitan Statistical Areas."[14] The radically changed world of expensive energy, the loss of farmland to development, and California's increasing population could lead to a situation around the year 2000 where California had little or no food to export. We must have food to live, and we currently get most of it from sources which we do not control.

If any disruption in our food supply occurred, perishables would disappear from the stores almost immediately, according to a spokesman for the Pennsylvania Grocers Association. With normal buying patterns, stores over 10,000 square feet might have canned goods for as long as a week; smaller stores without storage space would be empty sooner. If, however, people knew that a shortage was likely, a "food panic" would empty all the stores in less than a day.

Such scenarios are not mere fantasy; we've already had a taste of what they might be like. During the last oil shortage, grocery warehouses were out of almost 20 percent of all food items.[15] Because of inflation and the cost of money, grocery store, warehouse and food processor back-up inventories are even lower than usual. Winter storm warnings often cause local stores to empty out. If something similar happened on a state-wide scale, many of us would soon be hungry, and we wouldn't last long on the surplus supplies of ice cream, mushrooms and pretzels produced in the state. If a supply disruption lasted long enough, social order in food-short urban areas could even break down. A serious food shortage in a city could have an effect analogous to the yelling of "fire" in a crowded theatre.

2) Our food is more expensive and less tasty. Because we import most of our food, we have to pay the transportation costs. The bill comes to about $400 million a year, with over $40 million paying just for fresh vegetables.[16] That's over $1.2 million per day just for transportation costs that have to be paid by the Pennsylvania consumer. In addition, food that has to travel cross-country must be picked before it is fully ripe, so both its flavor and nutritional value suffer. In short, we end up paying more for food of lesser quality, while simultaneously hurting local farmers and the rest of Pennsylvania's economy.

Dependence on distant food also means drastic price rises if any problems occur. A study by the U.S. Department of Energy last year concluded that an energy shortage or reduction of 10 percent would lead to an increase of 55 percent in the price of fresh fruits and vegetables.[17] Our food prices are certain to rise as energy cost goes up and supply goes down.

3) Our local economy is weakened. Keeping more of our food dollars here would strengthen Pennsylvania. An economically healthy farming sector increases the strength of the whole region, since every dollar spent by a farmer generates another $2.20 in local business.[2] Instead of sending $6.7 billion (approximately 20 percent of the total 8.4 billion remains with Pennsylvania retailers) to agribusinesses in California and Florida, if our money went to Pennsylvania farmers, it would be spent locally or put in local banks. So if, for example, we produced all our food within the state, an additional $14.7 billion worth of local business would be generated.

What can we do?

The good news is that there are several things we can do to change this situation. Pennsylvania can produce much more of its food. A good place to begin might be with vegetables.

In Pennsylvania, we currently import over 80 percent of our fresh vegetables. (See Chart 4.) To produce all our vegetables within the state would require about 335,000 acres--4.5 percent of our total farmland.[18] Pennsylvania has the climate, soil types, and land to be totally self-reliant in vegetable crops.*

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*This takes into account the fact that certain types of vegetables thrive in specific soils. For example, onions prefer sandy loam or muck types of soil. To produce all the onions we consume in Pennsylvania we would need 4,579 acres of this kind of soil. We have over 266,000 acres,[19] yet we import 95 percent of our onions.

Chart #4 Amounts and costs of vegetables imported into Pennsylvania

FOOD PRODUCT	AMOUNT CONSUMED IN PENNSYLVANIA[1] (1,000 lbs.)	AMOUNT IMPORTED[2]	AMOUNT LEAVING PENNSYLVANIA[3] (wholesale cost)	TRANSPORTATION COST[4]
Potatoes	1,478,106.0	59.4%	$ 51,438,090	$11,215,769
Lettuce	315,563.9	93.9%	54,222,698	14,363,439
Tomatoes	157,195.4	82.0%	51,560,088	3,506,729
Onions	124,348.6	95.0%	11,813,115	2,683,994
Cabbage	104,405.9	50.0%	5,220,295	691,120
Snap Beans	16,423.4	80.0%	4,817,531	271,290
Celery	78,597.7	87.7%	10,339,526	2,702,488
Cucumbers	49,270.2	88.8%	10,937,976	973,590
Carrots	68,039.8	88.1%	9,590,880	2,238,080
Sweet Potatoes	64,520.5	99.3%	8,400,000	384,200
Broccoli	15,250.3	58.0%	3,186,000	811,172
TOTALS	2,471,721.7	80.2%[5]	$221,526,199	$39,841,871

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[1] These figures do not include consumption of food from home gardens.

[2] Obtained by dividing production by consumption weight and subtracting from 100%.

[3] Wholesale prices from Philadelphia Fresh Fruit and Vegetable Market Prices, 1979.

[4] Transportation costs do not include 100% of imported commodity, so they are a low estimate. Origins of produce were derived from Fresh Fruit and Vegetable Unloads in Eastern Cities, 1979. Philadelphia and Pittsburgh were used as representative of the origins of all produce coming into the state. Unloads are not recorded in any other Pennsylvania cities. The cost also represents only truck transportation. Costs are $1/mile. (American Trucking Trends, 1977-1978.)

[5] Average amount imported.

Self-reliance in vegetables would not necessarily require large changes in our diet. Using such methods as indoor propagation and transplanting, we could have a fresh supply of most vegetables for at least six months. Some crops--including carrots, potatoes, onions, beets, cabbage, turnips and squash-- keep well in cold storage and could be available in their fresh form nearly all year. (See chart 5.) Our 300-plus acres of greenhouses could produce part of our out-of-season vegetable needs. And since 30 percent of our present vegetable consumption is in the form of frozen (5.3 percent) or canned (25 percent) vegetables,[21] we could easily grow and preserve these in Pennsylvania.

It would also be possible to grow all our own vegetables without cutting back on any other crops. There are more than enough acres of good farmland now used for other purposes (designated "occasionally improved hayland") to do this.[22] What is perhaps needed more than anything to bring about this change are local markets so our farmers can be sure of selling their produce for a fair profit.

The evidence is clear that programs for growing and marketing produce locally benefit both the farmer and the consumer. The food is tastier and fresher, and far less energy is consumed in getting it to the table. United States Department of Agriculture studies of direct markets in Colorado showed that local farmers received 44 percent higher gross returns than if they had sold through wholesale channels, while consumers got an average 28 percent discount compared to supermarket prices.[23] A New York City study showed price savings ranging from 7 to 35 percent.

Chart #5 20

VEGETABLES FOR STORAGE

Beets. Pick mature vegetables before first killing frost. Pack in layers of damp sawdust or sand. Requirements: 32 to 40°F., 90 to 95 percent humidity. Life: 4 to 6 months.

Brussels sprouts. Harvest after a few mild frosts. Store in perforated plastic bags. Requirements: 32 to 40° F., 90 to 95 percent humidity. Life: 3 to 5 weeks.

Cabbage. Pick firm, solid heads, and trim off loose outer leaves. Place heads on shelves, string them up by the roots, or wrap in newspaper and store in boxes or bins. (Beware: cabbage emits a strong odor during storage.) Requirements: 32 to 40°F., 80 to 90 percent humidity. Life: 2 to 4 months.

Cabbage, Chinese. Store only mature, solid heads, picked before a severe frost. Store as with regular cabbage, or pack roots in damp soil or sand. Requirements: 32 to 40°F., 90 to 95 percent humidity. Life: 2 to 4 months.

Carrots. Dig before any hard freezes. Store in cartons of sawdust, sand, or leaves. Requirements: 32 to 40°F., 90 to 95 percent humidity. Life: 6 to 8 months.

Celery. Store in trenches in the garden, or place roots in boxes of sand or soil. Requirements: 32 to 40°F., 90 to 95 percent humidity. Life: 1 to 2 months.

Endive, escarole. Pick after moderate fall frosts. Store with roots in soil or sand. Requirements: 32 to 40°F., 80 to 90 percent humidity. Life: 2 to 3 months.

Garlic. After curing, store in paper bags, or braid into strings and hang from rafters. Requirements: 35 to 40°F., 60 to 70 percent humidity. Life: 6 to 8 months.

Horseradish. Dig anytime in fall. Store in damp sand or sawdust. Requirements: 32 to 40°F., 90 to 95 percent humidity. Life: 4 to 6 months.

Jerusalem artichokes. Mulch in garden or store in plastic bags or damp sand. Requirements: 32 to 40°F., 90 to 95 percent humidity. Life: 1 to 2 months.

Kohlrabi. Remove leaves and roots. Store in damp sand or sawdust. Requirements: 32 to 40°F., 90 to 95 percent humidity. Life: 2 to 3 months.

Onions. After curing, remove tops and store in bins or string bags, or braid and hang from rafters. Requirements: 35 to 40°F., 60 to 70 percent humidity. Life: 4 to 6 months.

Parsnips. Mulch in ground or store in damp sawdust, sand, or leaves. Requirements: 32 to 40°F., 90 to 95 percent humidity. Life: 4 to 6 months.

Potatoes, sweet. After curing, wrap individually in newspaper and pack in baskets, or pack loosely (make sure potatoes aren't touching) in cartons of sawdust. Requirements: 50 to 60°F., 60 to 70 percent humidity. Life: 3 to 5 months.

Potatoes, white. Late potatoes store best. After curing, pack in baskets or boxes. Don't store near apples, which give off a gas that promotes sprouting. Requirements: 32 to 40°F., 80 to 90 percent humidity. Life: 4 to 6 months.

Pumpkins. After curing, place on shelves or in boxes. Requirements: 50 to 60°F., 60 to 70 percent humidity. Life: 4 to 6 months.

Rutabagas. Dig after a few mild frosts. Store in damp sand, sawdust, or moss. Requirements: 32 to 40°F., 90 to 95 percent humidity. Life: 2 to 4 months.

Salsify. Mulch in garden, or store like parsnips. Requirements: 32 to 40°F., 90 to 95 percent humidity. Life: 1 to 2 months.

Squash, winter. After curing, pack on shelves or in boxes. Requirements: 50 to 60°F., 60 to 70 percent humidity. Life: 4 to 6 months.

Tomatoes, green. Pick mature green fruits before frost. They will gradually ripen at 55 to 70°F. Requirements: 50 to 60°F., 60 to 70 percent humidity. Life: 4 to 6 weeks.

Turnips. Harvest before a heavy freeze. Store like carrots. Requirements: 32 to 40°F., 90 to 95 percent humidity. Life: 2 to 4 months.

Another approach to increasing our food self-reliance is expanding the role of home gardens. Approximately 40 percent of the households in Pennsylvania have gardens, and these produce more than one-third of the vegetables we eat now.[24] If each of these 1.7 million gardens[25] produced 1,100 pounds of vegetables, they could provide all of Pennsylvania's vegetable needs. If each present gardener produced 770 pounds of vegetables, all of Pennsylvania's fresh vegetable needs could be provided. (These are not outrageous figures; many gardens produce far more than this.) Or if all Pennsylvania's households had gardens that produced 445 pounds of food (the average U.S. garden in 1979 produced 545 pounds)[24] all the state's vegetable needs could be met. This won't happen, of course, but it helps show the significant contribution home gardens already make to the state's food supply, self-reliance and economy, and that there are even greater possibilities.

We could also strengthen the Pennsylvania food system by increasing local fertilizer production. Last year, we used 580,720 tons of fertilizer, most of it from out of state.[26] But each year the livestock, poultry and humans in Pennsylvania produce more nitrogen, phosphates, and potash fertilizer than is needed by Pennsylvania farmers,[27] and much of this could be converted into usable commercial products.

Could Pennsylvania have a totally self-sufficient food system? Not with our present diet. We cannot grow such things as oranges, bananas, rice, sugar, peanuts, coffee, tea and cocoa. We do not have the land necessary to produce all the meat we eat. And it is questionable whether complete self-sufficiency is a worthwhile goal in itself. Perhaps moves to increase self-sufficiency should be based not on the goal of self-sufficiency, but on goals of reducing food costs, averting the risk of supply unavailability when that risk is unacceptable, and increasing the economic viability of Pennsylvania.

But given the vulnerability of our food supply, and the economic and nutritional advantages to Pennsylvania of eating locally produced food, it is clearly desirable for Pennsylvania to increase its self-reliance. In the event of outside problems we would then be more certain of an adequate food supply. It would not be difficult for us to produce all our vegetables--either commercially or in home gardens. And with the continuation of certain trends of change in our food consumption patterns we could greatly increase our self-reliance. For example, annual beef consumption has dropped in the last 5 years from 120 pounds per person to 106 pounds.[28] It is not hard to see why beef is so expensive in Pennsylvania--given that we import over 77 percent of it, and that producing beef is very energy intensive. What other foodstuffs will follow in the economic footsteps of beef? What other foods will Pennsylvanians no longer be able to afford?

To meet all our food needs--with the exception of beef and items which cannot be grown here--would take approximately 4.6 million acres,[29] about 60 percent of our total cropland. Just to produce all our beef locally would require about 9 million acres, 20 percent more farmland than the state has.[30] (Beef production requires huge amounts of space, both for pasture land and for cropland to raise feed grains.) But if we (1) took the land left after meeting all our other food needs, and (2) grew beef on most of it, and (3) cut our consumption by 80 percent (this would mean about 24 pounds per person yearly), and (4) substituted wheat, potatoes and beans, Pennsylvania could be almost totally self-reliant.

That chain of events is unlikely to happen. Most of us like our steaks and hamburgers too well. It is unlikely, though, that such a move would have a severe impact on Pennsylvania's meat producers, who currently grow about 22 percent of our beef. In addition, such a diet would provide more than enough protein, and shows one way we could cope with a serious food emergency.

There are other options as well. Poultry converts feed into meat much more efficiently than cows; it takes 10 times as much space to produce a pound of beef as it does to produce a pound of chicken.[31] So if we cut our consumption of red meat, and ate more drumsticks, we would free additional farmland for other crops. Livestock have an essential part to play in our food production cycle, but we must make sure they fit in appropriately, and that they support, not weaken, the system.

RECOMMENDATIONS FOR CHANGE

What can we do in order to bring about a transition to a more sustainable, self-reliant food system with its accompanying economic and nutritional benefits? There is no single, simple answer to this immense, complex question. Because the Pennsylvania food system is touched by everything from the California food producer, fast-food restaurant, grocery store, food broker and warehouser to the backyard garden and family dinner table and is affected by everything from federal, state and city government policies to business decisions to neighborhood and consumer organizations to individual actions, any thoughtful response has to be on a variety of different levels. There are responses that are appropriate for government decisionmakers, and there are other responses needed from business, from the community, and from individuals.

It is not feasible in this report to trace out all our possible options. What is feasible though, is to point out that: 1) a state plan for our food system is sorely needed which would enable us to increase our self-reliance and economic viability while also decreasing the potential for disruption; and 2) an emergency state plan for feeding Pennsylvanians during a supply disruption is crucial and given the current state of international affairs, national economy and state vulnerability, not to formulate one soon would be irresponsible; and 3) the Pennsylvania consumer can take a more active role in his or her own food system that will make our food system more economical.

This report concludes with The Cornucopia Project's recommendations in these three areas.

1. State plan for Pennsylvania's food system:

A state food plan for Pennsylvania needs to incorporate measures which will realize the following broad policy objectives.

A. INVENTORY, MAP AND PROTECT ALL REMAINING PRIME FARMLAND FROM DEVELOPMENT AND SPECULATION.

The inventory and mapping of Pennsylvania's farmland is a straightforward undertaking, capable of being done relatively easily, quickly and inexpensively by using Pennsylvania's enormous agricultural expertise at either our state land grant college or at other appropriate and interested institutions. Such an inventory would ideally include indentification of all agricultural lands, their potential, current status and likely availability for new farmers or farming ventures.

Preserving our remaining prime farmland by protecting it from development and speculation can and perhaps needs to involve a myriad of state and local policies that cover a spectrum of tax incentives and penalties, inheritance laws and local ordinances.

The Cornucopia Project has an ongoing task force engaged in making a comprehensive inventory of programs that other states, countries or research organizations have either instituted or proposed to deal with similar problems. This listing of options will be sent to anyone wishing a copy. One option that could be used in Pennsylvania is currently used in France, where owners of farmland within designated districts must, by law, notify a state-chartered non-profit corporation of their intention to sell their land. The corporation has the right to buy the farmland within 30 days. Capitalized by the government, these corporations function as revolving funds, reselling the land to farmers who will commit their land to commercial farming. Essentially, the state has "first refusal" rights to all agricultural land sold. Other strategies include tax changes that modify tax assessments of farmland to reflect current use value, the institution of capital gains tax on land sales and speculation, the establishment of a "circuit breaker" tax which allows farmers to reduce their total tax load when property taxes exceed a certain percentage of their total income (with farmers signing a contract that assures that their land use does not change), the establishment of property tax at the time of sale of farmland that will stay the same until the property is sold again, and the institution of a heavy tax on profits made on the development of previously agricultural land. Yet other options include state or municipality purchase of development rights from farmers (along with the resale or lease with restrictions on use), the establishment of a development permit system, tax incentives for farmland owners to voluntarily restrict development of their prime agricultural lands, state imposed agricultural zoning, voluntary agricultural districting (in use in New York) which provides substantial benefits to farmers, including freedom from being assessed for special services such as water, sewage, drainage, sanitary landfill, etc. and the "right-to-farm" principle, which provides that municipal ordinances may not prohibit normal farming practices. Additional options include the transfer of development rights, cluster development and "agricultural open space preserves" where each municipality would be required to designate an agricultural preserve within its boundaries composed of at least 70 percent of its prime farmland.

B. PRESERVE OUR SOIL BY INSTITUTING WIDESPREAD AND EFFECTIVE SOIL CONSERVATION PROGRAMS WITH STRONG INCENTIVE AND ENFORCEMENT PROVISIONS.

The options in The Cornucopia Project's overall list that could be used in Pennsylvania include tax incentives for soil conserving measures, such as investing in tillage equipment, refraining from Fall plowing and using contour plowing, "conservation achievement contracts" whereby farmers would be provided with annual payments determined by the amount of reduced erosion achieved, taxes on each ton of soil lost from agricultural land, the prohibition of all agricultural production activities which result in more than five tons of soil loss per acre per year, the linking of commodity support programs to soil conservation programs, and the linking of state purchase of farm commodities to soil conservation programs.

C. DEVELOP INCENTIVES FOR FARMERS TO PRODUCE A GREATER DIVERSITY OF CROPS FOR LOCAL CONSUMPTION.

In Pennsylvania, much has already been done in the area of marketing, especially direct farm marketing and the promotion of local agriculture. The system has a broad base of support, particularly in the southeastern part of the state, where farmers' markets have remained viable institutions in the local economy of Pennsylvania Germans. A 1978 USDA study indicated that Pennsylvania had nearly 200 farmers' markets, over 6,000 farmhouse, pick-your-own, and farm store operations, and over 500 roadside stands. The value of products sold directly to consumers totaled $68.6 million.[32] When milk juggers are included, the total becomes $140 million.[33] The Pennsylvania Department of Agriculture also has a promotional program with a logo campaign to identify Pennsylvania products and encourage support for local growers and producers. These programs are good beginnings and need only to be greatly expanded and fine-tuned.

Other options and/or strategies for improving the marketing system to strengthen regional agriculture include "forward contracts," which are agreements regarding delivery and acceptance of a specified commodity at some future date. A mandatory market reporting system would provide information necessary for decision making and identification of market alternatives. Grading standards should be revised to reflect nutritional status, product end uses, maturity and eating quality, rather than external appearances. The establishment of regional warehouses and storage facilities with efficient transport systems to move goods from the farm to the distribution center could be instituted. Public funds could be used to help establish the centers which would then be self-supporting through fees paid by producers. These centers would grade, pack and distribute the output of small local producers and provide large buyers with volumes and specifications they demand.[34] Farmers-Consumer Services Association, Inc. in West Chester, Pennsylvania is an example of such a regional warehouse/market system for local farmers.

The dairy industry already has an extensive marketing system established which makes dairying attractive to farmers since they are assured of both a market and a stable income as a result of the associated support system. Programs set up for other farm products would provide incentives for a more diversified agriculture, and would create stability for smaller-scale operations.

Other options include electronic markets which centralize price negotiation, allow for direct marketing but include the advantages of pricing accuracy normally associated with larger markets, and a forward deliverable contract market which could achieve the benefits of open market trading along with the benefits of contracting. Exclusive agency bargaining, vertical integration through ownership, joint ventures between agricultural cooperatives and agribusiness marketing firms, marketing orders, and marketing boards are all potentially viable alternative marketing strategies as well.[35]

Alternatives for marketing cull cows and dairy calves have also been suggested in a USDA report focused on the Northeast. These include regional auction market centers, regional electronic exchange, a combination regional market center-electronic exchange, and contract sales to packers.[36]

Perhaps one of the most important options that could be implemented relatively quickly is the state purchase of Pennsylvania grown crops. If state institutions, such as hospitals, schools, prisons, etc., all purchased locally grown food products it would provide a good market and incentive for Pennsylvania farmers.

Some other options that might work in Pennsylvania include tax incentives for small scale food producers (such as not taxing the first $10,000 of food produced for local consumption), tax incentives for local direct markets, incentives for attracting food processors to Pennsylvania who wish to reduce transportation costs by locating near a major distribution center, mandating the use of public farmlands for the production of crops for local consumption, instituting a more extensive program promoting and advertising state-grown products (to counter promotional programs of out-of state concerns), developing tax incentives for the purchase of local products by major distribution channels, assisting small growers through a state-wide marketing clearinghouse, developing legislation to enable and encourage institutional purchase of local produce, encouraging expansion of on-farm processing, cooling and fresh packing of local food crops, and developing consumer education programs to increase consumer awareness of locally-grown produce.

D. CONSERVE ENERGY AND NATURAL RESOURCES

Options in this area include developing incentives and methods for using local organic wastes such as leaves, brush, sewage sludge, etc., for fertilizer, developing incentives for water conservation measures, such as investment tax credits for drip irrigation equipment and cisterns, developing incentives for increasing the production of energy from agricultural lands in ways consistent with soil and water conservation principles, providing investment credits for construction of energy conserving barns, greenhouses, etc., and establishing an Agricultural Waste Council in the Pennsylvania Department of Agriculture to develop desirable legislation and other measures to facilitate the recycling of organic wastes.

E. REORIENT STATE AGRICULTURAL RESEARCH TO FOCUS MORE ON SUSTAINABLE FARMING METHODS AND LOCAL FOOD PRODUCTION.

Options in this area include the granting of additional funds to Pennsylvania's land grant university or reorienting existing research funds in these directions.

F. PRESERVE AND STRENGTHEN THE FAMILY FARM.

Ways to do this might include providing guaranteed state loans to beginning farmers with deferred or reduced payments until 5 years after start-up (as is being done in Minnesota), increasing support for direct farmer-to-consumer marketing channels, providing on-farm summer work opportunities for young people interested in learning about farming, developing "entry packages" for new farmers that would include help in obtaining the needed quantities of land, capital, agronomic advice along with managerial/organizational assistance, and developing a consulting program using retired farmers and others who may or may not have been in agriculture (e.g. financial specialists and accountants) to provide assistance to farmers who need managerial advice beyond or different from the capabilities of the USDA service.

G. DEVELOP REGIONAL AND COMMUNITY FOOD PLANS

One possibility here is to borrow a technique currently used in China, where cities are organized around their respective food systems. In this system a city's boundaries will include enough farmland to make the city as self-sufficient as possible. If the city gets more people it expands its jurisdiction over more surrounding farmland to make sure it can feed itself. Other options include establishing incentives for cities and neighborhood organizations to increase local food production, processing and storage with community greenhouses, gardens, orchards, food processing and storage centers, as well as contracting with local farmers to supply their foodstuffs (currently being done in Japan), and revising zoning ordinances to allow more agricultural practices in residential areas. Yet another option in this area would be establishing a state or regional Pennsylvania Food Industry Development Institute or TVA type of organization that could deal comprehensively with a region's food system.

2. Emergency State Food Plan:

An emergency state food plan for Pennsylvania needs to incorporate measures which will deal with the following contingencies:

A. A complete oil cutoff to the United States from all OPEC countries.

B. A multi-year drought in Pennsylvania's present day major food supply areas.

C. A near shutdown for one to four weeks of the U.S. trucking and rail system.

D. A widespread labor dispute in Pennsylvania's present-day major food supply centers that could cut off the flow of food into Pennsylvania.

E. An extraordinary leap in food prices so that only the wealthiest people in Pennsylvania could afford food.

Some options Pennsylvania has for dealing with such contingencies include the establishment of state or regional grain storage facilities, the encouragement of home, community and city storage of basic foodstuffs, the formation within our current Civil Defense organization of state-wide communication and coordination centers for dealing with a food emergency, and the general encouragement, expressed in all the above measures, of producing more and more of Pennsylvania's food within Pennsylvania.

3. Pennsylvania Consumer Activities

There are a wide variety of options available that will help the Pennsylvania consumer deal with the increasing price of food and the vulnerability of our supply.

These options include tax and other incentives for increasing the local production of food by expanding home gardens, producing food in the winter with small scale greenhouses or "growth frames," producing food in the winter in larger greenhouses or "sunspaces" that can be added on to existing houses, producing protein with small-scale fish, rabbit or quail culture, processing and storing more food at home and selectively buying foodstuffs in large quantities when they are in season and then preserving them.

Putting the most appropriate of these measures into practice could greatly increase Pennsylvania's food self-reliance and economic viability, and enhance the nutritional and flavor quality of the food Pennsylvanians consume. Such changes also decrease our vulnerability in times of national and international economic stress, and make Pennsylvania's food system more sustainable. The problems afflicting our food system are real, and they are growing each day. But there are solutions, and we still have the time to make changes. Without changes, the system will crash. With careful planning and action, the abundance we have historically known in Pennsylvania could continue. If Pennsylvania is truly concerned about the condition and future of its food system, then the state must be willing to spend the time and money to develop a realistic plan of action, and then to spend even more time and money to see this plan modified, accepted and implemented. The time to begin is now.

NOTES

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Pennsylvania Food Imports

AS DETERMINED BY FOOD PRODUCTION AND CONSUMPTION BY WEIGHT AND RETAIL VALUE

COMMODITY	PRODUCTION (Total Fresh & for Processed)			CONSUMPTION						
	Retail Weight[a] (1,000 lbs)	Retail Value[b] ($1,000) (1980 $)	Direct Market[c] $ Value of Sales (1,000)	Consumption in PA[d] (1,000 lbs.)	Retail Value ($1,000) (1980 $)	% Imported	Retail Value of Amount Imported ($1,000)	Amount Exported (% of Production)	Retail Value of Amount Exported ($1,000)	Amount of Land Required to Produce 100% of PA Consumption (Acres)
Meats										
Beef	209,612.16	487,557.88		933,787.6	2,171,990.	77.6	1,685,464.2			9,081,458.5[q]
Veal	16,841.7	50,491.42		18,769.6	56,271.26	10.3	5,795.94			--[r]
Lamb & Mutton	1,656.56	4,065.20		15,250.3	37,424.24	89.1	33,345.0			5,065.
Pork	136,849.79	186,526.26		757,822.6	1,032,912.2	81.9	845,955.09			829,071.
Poultry										
Chicken	380,085.12	272,521.03		607,665.8	435,696.37	37.5	163,386.14			452,132.3
Turkey	68,256.	65,320.99		119,656.2	114,510.98	43.	49,239.72			80,127.
Eggs	502,400.[e]	288,000.		419,969.8	239,382.78			19.6	56,423.54	203,571.
Livestock, Poultry & Products			8,775.17							
Fish	979.8[f]	2,204.55		160,714.7	361,508.07	99.4	359,438.42			9,398.5
Dairy Products			27,042.62							
Cheese	95,617.	238,086.33		192,388.4	479,047.11	50.3	240,960.69			320,647.
Condensed & Evap. Milk	100,598.	65,388.7		51,616.4	33,550.66			48.7	31,844.3	19,098.
Fluid Milk & Cream	8,084,000.	1,823,600.		2,780,247.	628,335.82			65.6	1,196,281.6	463,375.
Ice Cream	286,204.[g]	271,893.8		208,811.8	150,344.49			44.7	121,536.5	88,869.2
Dry whole & nonfat Milk	18,959.	39,055.54		40,471.95	83,372.22	53.2	44,354.02			62,731.5
Vegetables, Fresh										
Potatoes	600,000.[h]	88,800.	731.57	1,478,106.	218,759.68	59.1	129,286.97			59,124.
Lettuce	1,936.	741.49		315,563.9	120,860.97	99.4	120,135.8			17,212.9
Cabbage	52,400.	11,632.8	194.47	104,405.9	23,178.11	49.	11,357.27			5,800.
Tomatoes	175,120.	123,634.72	679.61	157,195.4	110,979.95			+		13,099.6
Sw. Corn	76,100.	9,132.	2,267.24	85,636.3	10,276.36			+		18,616.6
Snap Beans	23,140.	18,743.4	170.14	16,423.4	13,302.95			+		3,098.75
Onions	6,200.	1,382.6		124,348.6	27,729.74	95.	26,343.25			4,288.
Celery	9,675.	4,353.75		78,597.7	35,368.97	87.7	31,018.58			1,828.
Carrots	8,100.	2,608.2		68,039.8	21,908.82	88.1	19,301.67			2,520.
Sw. Potatoes	448.	112.		64,520.5	16,130.13	99.3	16,017.21			5,040.7
Cucumbers	5,500.	2,695.	163.77	49,270.2	24,142.40	88.2	21,293.6			4,479.
Peas	4,000.	1,920.		--[i]						
Squash	NC[j]	750.[k]	116.13	NC						
Peppers	4,650.	3,385.2	127.11	41,058.5	29,890.59	88.2	26,363.5			4,462.9
Mushrooms	213,790.	254,410.1		31,673.7	37,691.70			85.2	216,757.4	NA[s]
Asparagus	NC		41.94	3,519.3	3,484.11	98.8	3,442.3			1,466.4
Other	2,720.		107.85							NA
Artichokes	NC			2,346.2	1,665.80					NA
Broccoli	6,400.	5,696.		15,250.3	13,572.77	58.	7,872.2			1,906.3
Cauliflower	NC			12,904.1	6,839.17					1,434.
Spinach	NC[j]			5,865.5	4,633.75					938.5
Garlic	NC			9,384.8	7,226.3					782.
Dehydrated Onions	NC			31,673.7	150,450.07					NA
Eggplant	NC			7,038.6	3,448.91					454.
Dry Field Peas	NC			4,692.4	1,830.04					3,420.
Dry Edible Beans	NC			69,212.9	45,680.51					65,111.
Minor Vegs.[l]	NC			44,577.8	26,300.9					NA
Vegetables, Frozen										
Asparagus	NC			1,055.79	2,723.94					932.
Snap Beans	NC			12,082.93	10,995.47					3,789.
Lima Beans	NC			5,865.5	5,396.26					3,371.
Carrots	NC			11,731.0	6,803.98					724.
Peas	NC			18,183.05	12,728.14					6,123.
Broccoli	NC			16,423.4	15,438.0					2,053.
Brussels Sprouts	NC			3,284.68	2,956.21					299.
Spinach	NC			8,798.25	5,454.92					677.
Southern Greens	NC			3,636.61	2,254.70					280.
Cauliflower	NC			5,630.88	5,349.34					626.
Corn	NC			21,819.66	15,273.76					9,816.
Onions	NC			8,446.32	7,094.91					291.
Potato Products	NC			206,113.67	127,790.47					16,489.
Vegetables, Canned										
Asparagus	NC			4,692.4	7,226.30					5,053.
Lima Beans	NC			3,519.3	2,287.55					2,918.
Snap Beans	NC			66,866.7	30,090.02					11,197.
Carrots	NC			5,865.5	2,346.2					290.
Peas	NC			42,231.6	18,117.36					11,424.
Pumpkin Squash	NC			4,692.4	1,529.72					530.
Spinach	NC			8,211.7	4,270.08					597.
Whole Tomatoes	NC			59,828.1	26,204.71					2,533.
Catsup/Paste, etc.	NC			150,156.8	109,614.46					
Tomato Puree	NC			11,731.0	5,278.95					
Tomato & Veg. Juices	NC			35,193.	9,502.11					
Beets	NC			16,423.4	6,175.20					884.
Corn	NC			70,386.0	27,450.54					31,664.
Pickles	NC			98,540.4	98,540.4					4,582.
Sauerkraut	NC			15,250.3	7,106.64					1,350.
Sw. Potatoes	NC			11,731.0	9,032.87					1,184.
Fruits, Fresh										
Apples	505,000.	269,165.	5,875.23	199,427.	106,294.59			61.4	168,874.7	14,292.
Peaches Nectarines	90,000.	44,100.	2,376.90	64,520.5	31,615.05			32.	14,872.61	8,101.5
Pears	5,600.	3,074.4	305.47	28,154.4	15,456.77	78.	12,056.28			4,048.5
Sw. Cherries	1,900.	1,881.	316.84	7,038.6	6,968.21	68.5	4,773.2			7,351.6
Strawberries	3,300.	3,267.	2,312.72	23,462.0	23,227.38	76.	17,652.81			7,110.
Bananas	0.	0.		241,658.6	77,814.07	100.	77,814.07			NA
Oranges Citrus	0.	0.		312,044.6[m]	135,115.31	100.	135,115.31			NA
Grapes	111,000.	104,340.	132.47	36,366.1	34,184.13			67.3	70,309.97	7,992.5
Melons	NC		407.81	256,908.9	20,552.71	98.	20,141.66			21,232.
Plums, Prunes	NC		89.33	17,596.5	8,622.29	99.	8,536.06			2,695.5
Other (Fruits & Nuts)			202.43							NA
Sour Cherries	6,300.	3,125.		NC						NA
Fats and Oils										
Butter	38,412.	69,141.6		52,789.5	95,021.1	27.2	25,845.74			185,643.
Lard	40,173.3	27,719.58		25,808.2	17,807.66			35.8	9,923.61	--[t]
Margarine	NC			133,733.4	98,294.05					
Shortening	NC			213,504.2	166,106.26					
Oils	NC			272,159.2	288,488.75	86.2	248,677.3			
Grains										
Wheat	7,561.[n]	1,739.03		1,371,353.9[o]	331,060.55	99.7	329,215.02			978,927.5
Rye	Insignificant			9,384.8	4,692.4	100.	4,692.4			6,982.7
Oats	Insignificant			37,539.2	22,148.13	100.	22,148.13			21,329.1
Barley	Insignificant			14,077.2	8,587.09	100.	8,587.09			5,865.5
Soybeans	28,863. (oil)	39,830.94		NC				100.[u]	39,830.94	NA
Rice	0.			68,039.8	36,605.41	100.	36,605.41			NA
Corn Meal	122,731.64	50,319.97		90,328.7	37,034.77					28,543.9
Corn Cereal	NC			26,981.3	30,758.68					
Corn Syrup, Sugar, Starch	NC			493,875.1	335,835.06					
Processed Fruit Products[p]			117.03							
Dried Fruits	NC			29,327.5	58,655.					
Frozen Fruits	NC			132,560.3	159,072.36					
Fruit Juice - Canned	NC			276,851.6	138,425.8					
Canned Fruit	NC			222,889.	156,022.3					
Sugar	0.			1,087,463.7	286,002.95	100.	286,002.95			218,680.[v]
Coffee, Tea, Cocoa	0.			132,560.3	516,985.17	100.	516,985.17			NA
Tree Nuts	NC			20,060.01	50,150.03					--
Peanuts	0.			7,390.53	6,577.57	100.	6,577.57			NA
Maple Syrup	57,000. (gal.)	684.								
Honey	3,034.	3,034.		12,904.1	12,904.1					
Honey & Syrups			238.95							
Edible Syrups				4,692.4	6,100.12	78.6	14,937.32			
		4,946,130.19	52,792.81							
TOTALS	12,056,113.07	4,998,922.99		15,980,320.13	11,571,617.93		5,616,735.05		1,926,655.17	13,469,097.95

About 80 percent of the vegetables consumed in Pennsylvania come from outside the state. Yet Pennsylvania has the climate, necessary soil types, and enough available farmland to be nearly self-sufficient in vegetable production.

Retail Value of Pa. Production $4,998,922,990
Retail Value of Pa. Exports 1,926,655,170
Value of Production remaining $3,072,267,820 = 27% of
Consumption in state.

Pa. imports 73% of its food.

---

[a] Retail weights for Pa. production are taken directly from 1979 Crop and Livestock Annual Summary or converted using USDA Conversion figures. Production estimates for vegetables not surveyed by the Pa. Crop Reporting Service were supplied by Dr. Pete Ferretti of Penn State; these are the only estimates available.

[b] Prices were supplied by: U.S. Dept. of Labor, Bureau of Labor Statistics; Mr. R. Keene, USDA Market News Service, Livestock; Schantz Markets, Emmaus; Philadelphia Fresh Fruit and Vegetable Wholesale Market Prices 1979; Foods Naturally, Emmaus; and Fenstermachers, Emmaus, Pa.

[c] Farmer-to-Consumer Direct Marketing in Six States, July 1980, ESCS, USDA, Ag. Info. Bull. No. 36.

[d] Consumption in Pa. is based on U.S. per capita consumption figures as they appear in Agricultural Statistics 1979 and Food Consumption, Prices, and Expenditures, USDA Statistical Bulletin No. 656.

[e] 320,000,000 Dozen.

[f] Aquaculture: Catfish and Trout, Inventory and Sales 1980. USDA Crop Reporting Board, Statistical Bulletin No. 644.

[g] 71,551,000 gallons.

[h] These production figures are generous; they assume no loss or waste between producer and consumer.

[i] Included in minor vegetables.

[j] Data Not Collected by USDA, Pa. Dept. of Agriculture, or other agencies.

[k] Value of squash for processing, Dr. Pete Ferretti.

[l] Includes peas, kale, lima beans, beets, and brussels sprouts. Price used for retail value is an average of these vegetables.

[m] Based on average price of oranges, lemons, grapefruit.

[n] Flour

[o] Includes wheat flour and cereal.

[p] Cider, jams, etc.

[q] Based on acreage requirements of 90% marginal land, i.e. hillsides and land unsuited for crops. Dr. Lowell Wilson, Penn State University.

[r] Veal is a by-product of the dairy industry, so land area would be included in dairy products.

[s] Not Applicable

[t] Lard is a by-product of hog slaughter.

[u] Pa. has no processing plants, so all soybeans would be exported. Dr. Elwood Hatley, Penn State University.

[v] Using sugar beets as raw material, with yields of 20 tons/acre.

+ Tomatoes, sweet corn and snap beans are grown for processing as well as fresh market, so any amount over that consumed would be used for processing in Pa.

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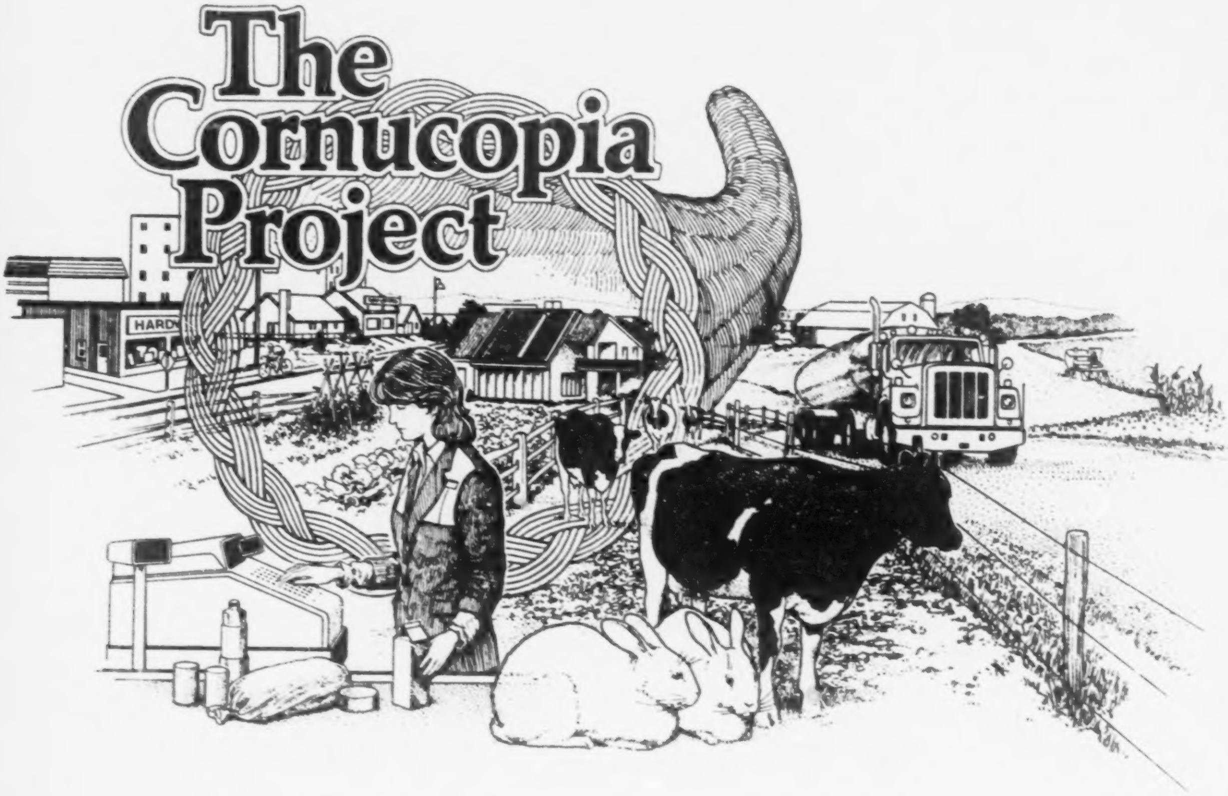
The Cornucopia Project
HARD

THE MAINE FOOD SYSTEM: A TIME FOR CHANGE

A study of the food system of Maine by

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1981

CONTENTS

Preface.. 1

I. Introduction.. 2

II. The Frightening Facts.................................... 4

III. What Do These Facts Mean?............................... 12

IV. What Can We Do?.. 18

Recommendations For Change................................... 30

Notes.. 40

CHARTS AND GRAPHS

Figure 1 - Number of Farms................................... 7

Figure 2 - Land in Farms..................................... 7

Figure 3 - Commercial Fish Landings.......................... 10

Figure 4 - Catch of Lobsters................................. 10

Figure 5 - Productivity of Potato Farms...................... 16

Figure 6 - Vegetables For Storage............................ 21

Figure 7 - Maine Food Imports................................ 44

Preface

This report is based on a study of the food system in Maine. The study did not merely look at agriculture, or any other particular part of the food system in isolation. Rather, it was an attempt to look at all the parts of the system, to see how they interact and work together to create the structure which provides our food.

When most of us think of food, we think of eating. This is not surprising since we are all consumers. However, the consumption of food is only one part of a large complex system. Tremendous amounts of labor, resources and technology are required to produce, process, and distribute our food. All of us are familiar with the consumption part of the food system, but most of us have little contact with the other parts, and know almost nothing about the system that feeds us. A primary aim of The Cornucopia Project is to help people look at their food system as a whole, get a clear picture of its present status, and work for constructive change.

While the concept of a food system may be new for many Maine people, the idea of self-reliance is not. There has been a great deal of speculation about the feasibility of food self-reliance for Maine. Many have dismissed the idea as being impractical and naive. However, given the findings of this study, if Maine is to have a food supply that is reliable and sustainable, increased self-reliance is both practical and necessary.

I. Introduction

When out-of-staters think of Maine, they tend to think of a place of wild and unspoiled beauty, of small towns surrounded by miles of farmland, fields and forest. They think of the rugged Maine coastline and of little fishing villages, of self-sufficiency and of Yankee ingenuity. Although these things still are important to the flavor of our state, a closer look reveals that Maine faces the same problems of urbanization, industrialization and environmental deterioration that confront other states.

Common results of industrialization are centralization and specialization along with rural decay. While movements from a rural to an urban society, from the farm to the factory and from self-sufficiency to interdependence have been seen as desirable in the past, there are a growing number of indications that we have become overly dependent upon a complex national system which in the future may not prove to be very dependable.

In particular, by specializing our own production of food and relying on a "trade" relationship with a national system, we may have weakened our state, rather than having strengthened it. Especially when future possibilities are considered, these discoveries should be of immediate concern:

- Over 70 percent of the food we eat is produced outside Maine.
- We spend over $700 million every year on food from outside the state; transportation alone costs us $56 million.
- Between 1940 and 1975, Maine lost 78 percent of its farms and over 60 percent of its farmland.
- An Army Corps of Engineers study estimated that if present practices continue, Aroostook County will lose 72 percent of its current acreage in potato production to soil erosion within the next 50 years.
- About 60 percent of Maine's agriculture production income is for animal products; we import over 90 percent of the feed grain used to raise these animals at prices that (due to transportation costs) are putting Maine farmers out of business.

In recent years, much has been said about the critical problems of Maine agriculture and of the Maine economy in general. Reports have been written and recommendations have been made. However, relatively little is being done. We may be moving in some of the right directions, but when we consider ourselves in the context of the rapidly changing global food situation, we certainly are not moving quickly enough.

The problems in Maine are very real, and they are compounded by the fact that the same problems are occurring across the country and around the world. Every day, while the U.S. population grows by 5,000, the nation loses the productive equivalent of 25 square miles of agricultural land to erosion and farmland development. In addition, repeated, heavy applications of chemicals and continuous single-cropping are destroying the fertility of our soil. The supply of fertilizer minerals is rapidly depleting.

Our entire food system is powered by non-renewable fuels. Processing, packaging and transporting food use 60 percent more energy than all the farms that produce our food.[1] Dependence on long-distance food transport makes supplies tenuous in many areas. Farm debts are at record levels and rising astronomically; they've shot up 650 percent in the last 20 years.[2] Irrigated farmlands in the West, which produce a large share of the nation's foodstuffs, are threatened by declining water tables and increasing salt build-up. Last year's drought caused major losses in our corn, soybean, sorghum and peanut crops, and more severe weather patterns are predicted for the future.

In previous times, the connections between Maine agriculture and events occurring in the rest of the world may have been slight or "uncertain" as they are described in a recent report on Maine agriculture.[3] However, such an age of isolationism has ended. Like it or not, we are living in a single global village whose survival is dependent upon the willingness of its citizens to think in terms of the welfare of all people.

Whether or not Maine's present food system is actually detrimental to the world as a whole, our own supply of food is quite vulnerable. An energy cutback, a transportation strike, a freeze, drought or labor dispute in California -- any of these could mean a food crisis. Our method of producing food is wearing away our state's productive capabilities. In earlier times, a food system that consumed resources so heavily seemed to make sense. In today's world, it certainly does not.

But the situation is far from hopeless. Maine has the resources, both in land and people, to change this dangerous position. We can preserve our farms and farmland, increase our self-reliance, and develop a secure food supply, if we act now. The purpose of this report is to help us begin to do that.

II. The Frightening Facts

Maine's food system is in trouble. The biggest danger is that the situation may become critical before it even seems serious.

Maine people have historically taken pride in being able to take care of themselves. Living in a state that still has a relatively unspoiled environment and many unexploited natural resources gives us a feeling of security. Many of our grandparents were self-sufficient in terms of food, fuel and shelter. The recent proliferation of home gardens, woodstoves and solar heated buildings are all evidence of a continuing value in self-reliance.

In terms of food production, Maine leads the U.S. in lobster and low-bush blueberries. It ranks near the top in potatoes, fish, shellfish, broilers and eggs, and produces substantial amounts of dairy products and apples.[1]

Despite the fact that Maine is no longer a "farm state" (agriculture is the third ranking enterprise behind paper and food processing), Maine has over 8,200 farms and about one million acres of prime cropland and pasture.[2,3] In addition, Maine has about 15,000 fishermen and over 7,000 fishing boats.[4]

Each year Maine generates over $400 million in farm receipts and over $90 million in fishery products.[5,6] Maine has 31 percent of all farmland in New England[7] and over 30 percent of the total New England fishery catch value.[4] The retail value of all food production in Maine was over $1.6 billion in 1980.[8]

Despite this abundance, in terms of necessities, our state has been dependent on outside suppliers for a long time. Only 12.3 percent of our energy and 27 percent of our food needs are produced within the state.[7,8] In order to feed us, more than 700 truckloads of food from such distant places as California, Arizona and Florida come rolling into the state each week.[9] Among these imports are nearly 100 percent of our grains, oils, shortenings, lettuce, tomatoes, turkey and hard cheeses, 96 percent of our pork and 90 percent of our beef.[8]

Since most of our food comes from far away places, that is where our food dollars go. Maine people spent over $1.0 billion for food in 1980 -- $940 for every child, woman and man in the state. Of this amount $700 million was paid for food produced outside Maine.[8] This is about $623 for every person in the state each year. About $1.5 million leaves the state each day to pay for our imported foodstuffs.

As we have become more dependent on other states to supply our food, we also have become more dependent on transportation and marketing systems for handling the food that is produced in the state. Since we export 83 percent of the state's agricultural and fishery products, we rely heavily on other states to consume our food.[8]

But these figures on food imports and dollar exports do not tell the whole story. Food production in Maine has suffered a long decline, further increasing our dependence on a national food system whose sustainability is being brought to question.

In the U.S. as a whole, urban sprawl and development have eaten into the farmland base. In contrast, the loss of farmland in Maine has been due to abandonment. When agriculture moved west and became increasingly mechanized, many eastern farms suddenly found themselves at an economic disadvantage. Part of the reason for this economic disadvantage is that agriculture in the west was subsidized through cheap irrigation, cheap migrant labor, low energy costs and vast sums of research money that went (and still goes) to fund agricultural research and technological innovations oriented towards large farms. In Maine, traditionally a small-farm state, the problems of climate, terrain, soils, geographical location (being at the end-of-the-line in the nation's transportation routes) and other region's subsidies, generally combine to make production costs higher and productivity lower than in other regions. Many small farms have simply folded. The remaining agriculture has become mechanized and highly specialized. Farms found they could survive only by producing large quantities of a reduced variety of crops.

Although Maine has not lost a great deal of farmland to development, its total loss of farmland has roughly paralleled that of the U.S. The number of farms in Maine has dropped sharply since 1880, the year Maine farming was at its peak. At that time our state had 6.6 million acres of farmland, 64,000 farms and over one million livestock.[10] In 1880 Maine had 4 times as much farmland, 8 times as many farms and 10 times as many livestock as it has now. In just the 25 years from 1949 to 1974, we lost 78 percent of our farms and 62 percent of our farmland.[11] If this trend

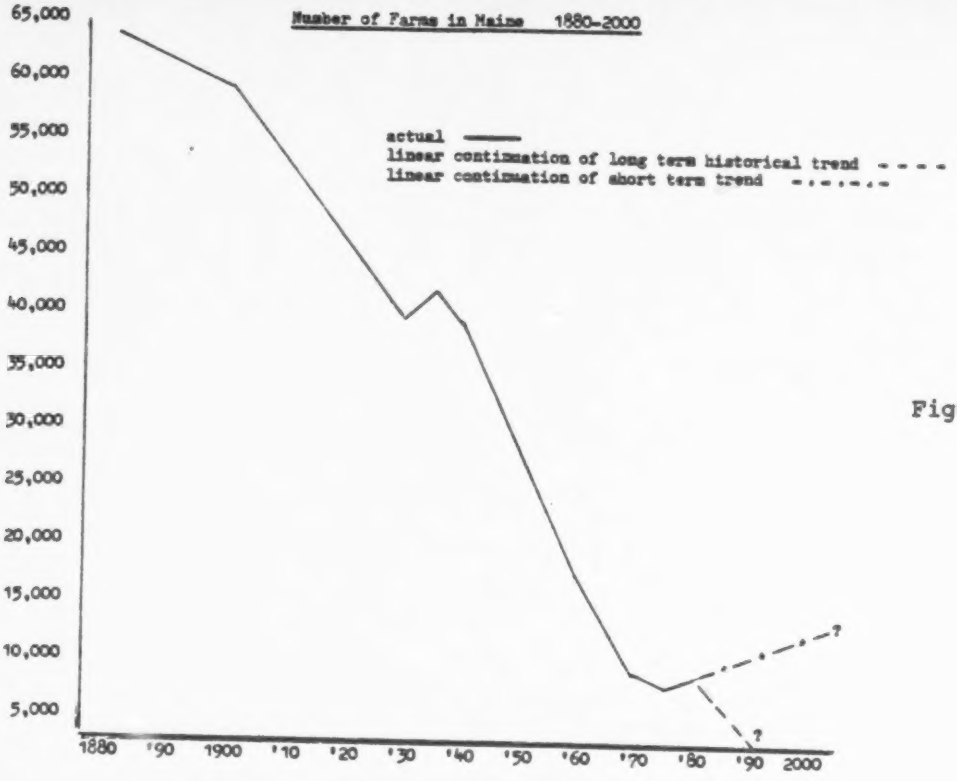

Number of Farms in Maine 1880-2000

Figure 1

Source: Census of Agriculture, U.S. Department of Agriculture

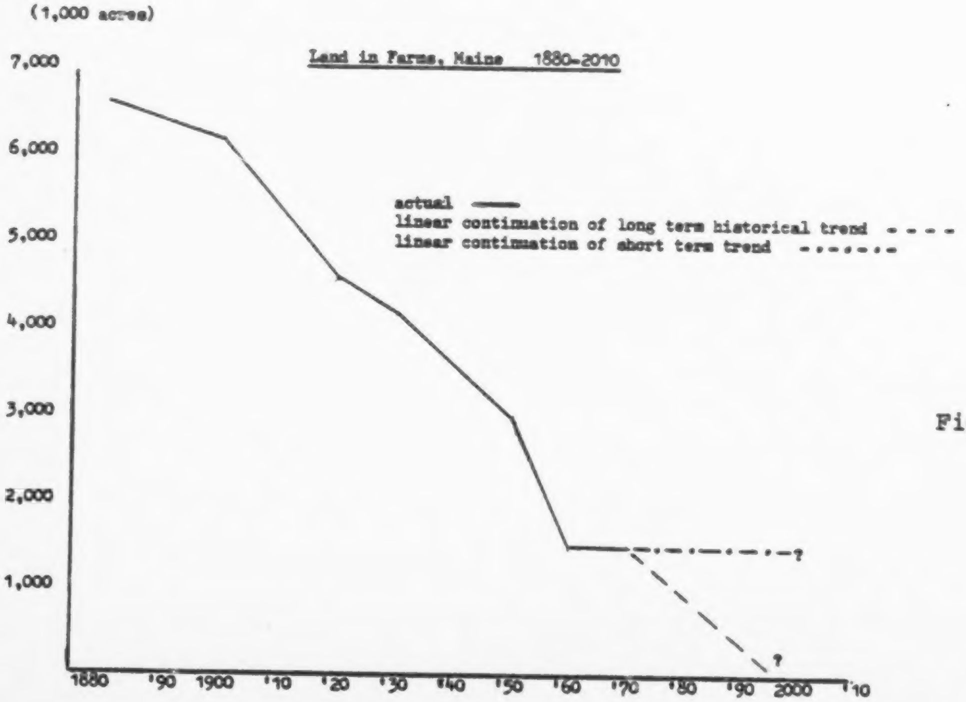

Land in Farms, Maine 1880-2010

Figure 2

Sources: U.S. Department of Agriculture, Census of Agriculture were to continue, our grandchildren would never know what a farm looks like.

Part of the reason for the decrease in the number of farms is the increase in size. Since 1880 the average farm size in Maine has grown by 225 percent.[10] The farm population in 1970 was only 17 percent of what it was in 1940.[12] This means that the power over our food system is being concentrated in fewer and fewer hands. A system dependent on large farms is less flexible or adaptable in times of stress than one composed of many small farms. And for some crops, large farms are less efficient than smaller ones.[13]

Erosion can be both a cause and an effect of agricultural decline. Intensified by the fierce competitive pressures facing Maine farmers, erosion has been highly destructive to farmland here. Our croplands annually lose 2.7 million tons of soil to sheet and rill erosion[14] -- enough to cover one lane the entire length of Interstate 95, from Kittery to Houlton, with over 3 feet of soil.[15] The loss of soil is worst in Aroostook County which has 82 percent of the state's tilled cropland. The annual loss there of six to nine tons per acre is two to three times the rate acceptable by USDA criteria.[16] The erosion in many fields is so serious that the Commission on Maine's Future concluded: "Erosion and depletion of soils is occurring so rapidly that within 25 to 50 years it may no longer be possible to grow potatoes in much of Aroostook County."[7] The Army Corps of Engineers reported that in the next 50 years, Aroostook County will lose 130,000 acres to soil erosion, 72 percent of its current acreage in potatoes, leaving only about 50,000 acres for potato production.[17]

Erosion is a "natural" process that affects nearly all soils. Intensive chemical farming, with continuous planting of row crops and use of heavy equipment that compacts the soil, increases the erosion beyond a sustainable rate. Maine's soils are relatively thin and infertile to begin with; we cannot afford to be as "careless" as those in regions with thick topsoil.

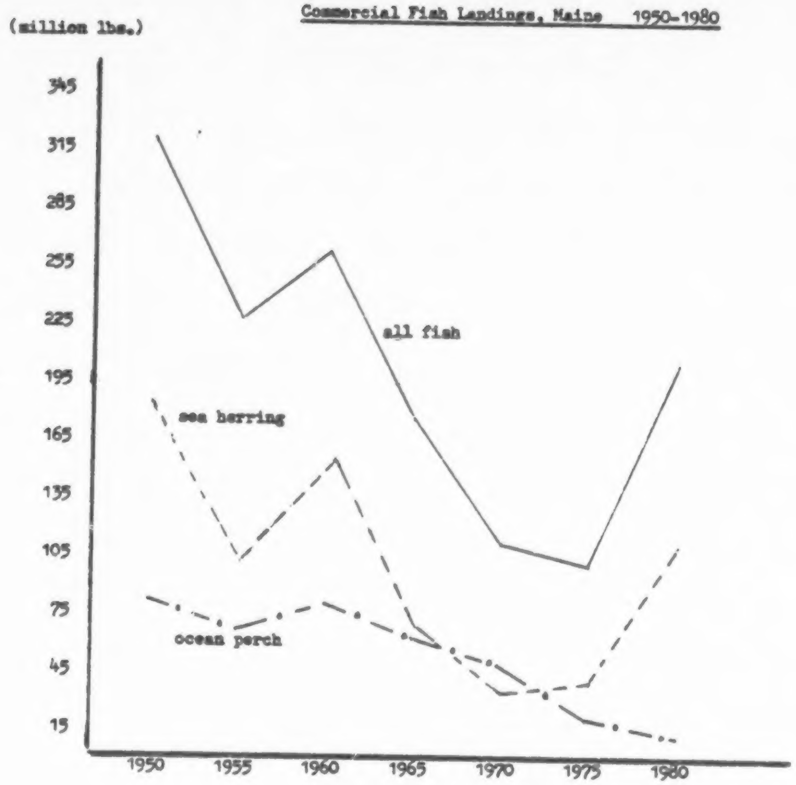
Measured in terms of acres lost, the soil eroded from croplands in Maine would come to over 2,800 acres annually.[18] Besides endangering our future, this destruction of soil exacts a heavy price in the present. Each foot of eroded soil can store about two inches of water for crops, and an acre-foot contains about 8,000 pounds of nitrogen and 2,000 pounds of phosphorus.[19] So through erosion, Maine loses about 11 million pounds of nitrogen and 2.8 million pounds of phosphorus each year. At current prices, this represents an annual loss of over $4 million in just fertilizer materials -- about 22 percent of Maine's fertilizer consumption in 1978.[20] And this does not include the value of the 77 million gallons of water storage capacity lost or the long-term decrease in the productivity of the soil.

Just as agriculture has suffered from loss of farmlands and increased energy inputs, U.S. fishery stocks have become depleted and world fisheries have suffered declining productivity. The problems of the world fisheries directly affect us because the U.S. imports about 60 percent of its fish.[21] On the national level, gradual increases in total fishery production have been attained. However, these increases have been paralleled by increased numbers of fishermen and fishing vessels.

Maine is blessed with over 3,500 miles of coastline, bays, islands and inlets. Our state has been endowed with a rich fisheries resource. In 1980 the weight of commercial fish landings in Maine was 638 million pounds, enough to feed nearly 7 million people.[22] However, the amount of fish landed in Maine has actually declined by 31 percent since 1950.[4]

Fisheries differ from agriculture in that fish represent a "free resource"; there is no cost in raising the "crop" but only in harvesting it. Thus, a decline in fishery catch does not necessarily signify stock depletion. A decline could be the result of a reduced "fishing effort". However, there

Commercial Fish Landings, Maine 1950-1980



Source: Maine Landings, Annual Summaries 1950-1980

Figure 3

Catch of Lobsters, Maine 1950-1980

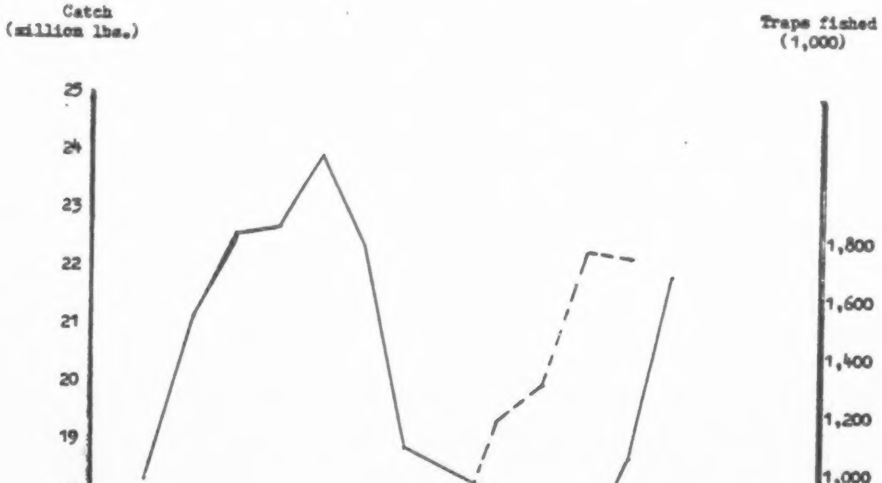


Figure 4

Source: Maine Dept. of Marine Resources, "Fisheries Management and Completion Report" are many indications that overfishing has indeed been the cause of smaller harvests. The Maine fishing industry faces diminishing returns per unit of fishing effort.

A good example is the lobster industry, presently the leading marine resource in terms of dollar value. Between 1951 and 1955 there was an average of 5,400 lobster fishermen using a total of 462,000 traps; total landings averaged 21.5 million pounds per year.[23] Since that time, the number of fishermen has increased by 80 percent and the total number of traps by 279 percent. Meanwhile the lobster catch has dropped by 16 percent. A recent Department of Maine Resources study showed that 86 percent of the legal sized lobsters are caught each year, leaving few lobsters as breeding stock. The study concluded that the failure of a single year class of lobster would directly lead to a collapse of the lobster industry for at least one year. Another example is the mussel industry. Sustainable harvest rates have been estimated to be 1.5 million pounds per year. The harvests in 1978 and 1979 were 3 million pounds each year.[23]

In addition to overfishing, water pollution threatens the fishery stocks in both marine and inland waters. In the 15 years between 1961 and 1975, there were over 465 million pollution-caused fish kills reported in the United States.[24] Since these numbers are only reported incidents, they represent only a fraction of the total loss due to water pollution. In Maine, there were 93,695 fish kills reported, most occurring in rivers. Agricultural pesticides, fertilizers and industrial operations are listed as the major sources of pollution.[24] Although relatively little is known about the extent of damage to the fisheries and the health-hazards to those who eat fish, we continue to use our waters as dumping grounds. So far we have been fortunate; we have not felt the effects a major oil spill might have on Maine fisheries and on our food supply.

In much the same way as agricultural decline, the decline of the fisheries can be traced to competitive disadvantages confronting Maine producers. In the case of the fisheries, Maine fishermen are ill-equipped and piers are inadequate. They also experience a problem common to U.S. fishermen in general; they must compete with largely government-subsidized foreign fleets. It appears that neither the farmer nor the fisherman is getting an adequate return for his or her efforts. Increasingly, it has become difficult to make a living in the business of food production. While in the past, dependence on other regions has not been considered "unhealthy", there are many reasons to feel that if Maine is to thrive in the future, we must move toward greater food self-reliance.

III. What do These Facts Mean?

This situation represents much more than some unusual numbers. Together, these numbers add up to some disturbing news for anyone in Maine who eats.

1.) Our food supply is vulnerable. Because we depend on outside producers for most of our food, our supply is highly uncertain. In addition, most of the food production that does occur in the state cannot occur without inputs of fuel, fertilizers and feed grains, all from outside sources. An oil embargo or energy shortage, a labor dispute, a drought or a crop failure in the midwest or California -- any of these -- alone or in combination -- could lead to serious shortages of foods which Maine now imports while at the same time hobbling our existing food production systems. A California Department of Agriculture study indicated that "California's enviable position in agricultural productivity has been built upon relatively inexpensive energy inputs and available supplies", and that "most of California's best farmland lies within counties designated as Standard Metropolitan Statistical Areas".[25] The radically changed world of expensive energy, the loss of farmland to development, and California's increasing population, could lead to a situation around the year 2000 where California has little or no food to export. Thus, any notion that development of farmland is a problem that "doesn't affect Maine" is only false security. Loss of farmland in other states directly affects us, because it directly affects our food supply. We must have food to live, and we currently get most of it from sources which we do not control.

If any disruption in our food supply occurred, perishables would disappear from the stores almost immediately.[26] With normal buying patterns, stores over 10,000 square feet might have canned goods for as long as a week; smaller stores without storage space would empty sooner. If, however, people knew that a food shortage was likely, a "food panic" probably would empty all the stores in less than a day.

Such scenarios are not mere fantasy; we've already had a taste of what they might be like. During the last oil shortage, a study showed that in Pennsylvania, grocery warehouses were out of almost 20 percent of all food items.[26] Being situated at the end of the nation's oil pipelines and transportation systems plus having a wholesale distribution system dominated by one major wholesaler makes Maine even more vulnerable to disruption of supply. Perhaps we could subsist for a while on in-state production of surplus fish, potatoes, poultry, eggs, milk, apples and blueberries, but even these commodities could not be produced by our present system if our supply of inputs were cut off. Our addiction to these inputs is costly. For example, we import over $260 million worth of livestock feed, over $26 million in fertilizers and our farms spend $43 million for fuel and electricity each year.[20] Fishing, especially off-shore trawling, is an energy intensive activity requiring approximately ten calories of fossil fuel energy to produce one calorie of food protein.[27] It could not continue if fuel supplies were cut off.

2.) Our food is more expensive and less tasty. Partly due to added transportation distances, the Maine food bill is more than 10 percent higher than the national average.[28] This figure is substantial, especially when you consider that the per capita income is only 81 percent of the national average.[7] The practice of importing most of our food is a costly one; the bill comes to over $56 million a year for transportation. We pay $5 million just to bring in our fresh vegetables.[29] Another $3 million worth of fresh vegetables is "lost" to spoilage during long-distance transport.[30] Over $153,000 per day is paid by Maine consumers for transportation costs alone.

High transportation costs affect producers as well. The poultry industry (broilers and eggs) accounts for about 40 percent of the state's farm income.* Feed (mostly corn and soy meal) is the major cost involved in raising poultry. In order to feed our poultry, we import about one million tons of grain from the midwest each year; this amounts to 97 percent of the amount consumed.[16] We grow only three percent of the grain we need, shipping the rest in by rail from the midwest, despite the fact that transportation costs here are higher than in any other poultry producing area in the country.[31] Not only are distances greater, but the rates per ton-mile for rail car shipments to Maine are higher than in other areas.[31] These factors result in an added cost of $50.00 per ton in the price of grain over that paid by farmers in the South.[32] Similarly, the production of potatoes in this state has been an example of "input agriculture". In the case of potatoes, fertilizers are the costly import, representing 14 percent of production expenses.[33] Faced with declining productivity due to decades of intensive cultivation, soil compaction and erosion, farmers have relied more and more on these imported nutrients in "feeding" their potato crops. The condition of our soils makes our producers more dependent on fertilizers than those in other potato-producing areas. Given present production techniques, without the use of fertilizers, potato yields in Maine would probably drop from 25,000 to 7,000 pounds per acre.[34] Even with increased use of fertilizers, Maine potato farmers have experienced decreases in yields. While yields in Maine have fallen, yields per acre elsewhere have increased, leaving Maine at a competitive disadvantage to producing areas in other states (See Figure 5).

---

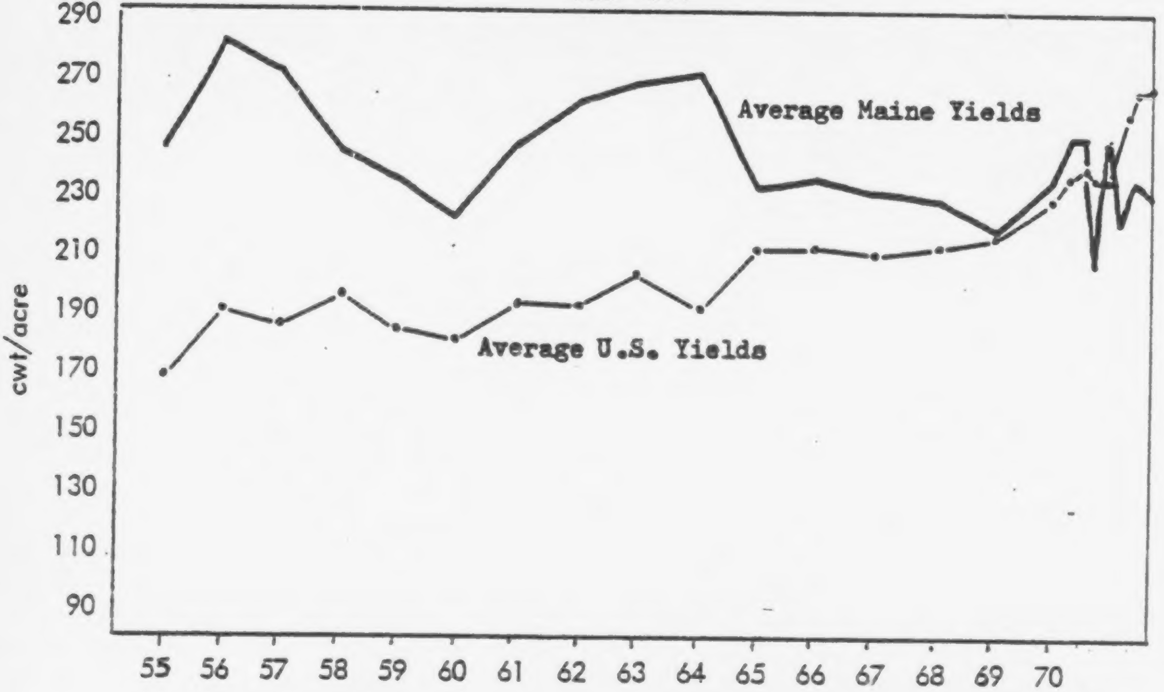
*As this study goes into print, the Maine broiler industry is in a state of almost total collapse. The demise of the industry is being blamed on economic difficulties stemming from poor management, unfavorable government policies and overproduction.

In addition to being expensive, transportation has been unreliable. The poultry industry lives in constant fear of a disruption of grain supply (storage facilities give us only a three to five day supply should rail shipments be halted). The potato industry also found the railroads to be unreliable for shipping potatoes to northeastern markets. However, they have yet to find a satisfactory solution. In 1978, the potato industry reported having trucking shortages 55 percent of the time.[31]

The future of Maine's primary products, poultry and potatoes, which together account for 72 percent of the state's agricultural income,[31] is quite gloomy. Under the current system, the essential nutrients required by both these industries are imported. The farm serves merely as a "mixing bowl" for a number of ingredients that are shipped in separately and then transported out as a finished product. As transportation costs rise, this inefficient way of using Maine as a mixing bowl will make less and less sense. In the future, the mixing will take place either where the ingredients are produced or where they are consumed.

Even if we found other producing areas, other markets and transportation linkages to be reliable, there are additional factors to consider. Food that travels cross-country generally suffers in nutritional value and in

The Decrease in Relative Productivity of Maine Potato Farms:
Average Potato Yields for Maine and the U.S.
1955-1977



reprinted from: Maine State Planning Office, Agriculture in Maine: A Policy Report," second printing;(Augusta, Maine March 1979) p. 11

Figure 5

flavor, because it must be picked before it is fully ripe. In short, we end up paying more for food of lesser quality, while simultaneously discouraging local production and hurting the Maine economy.

3.) Our local economy is weakened. Keeping more of our food dollars here would strengthen Maine. An economically healthy fishing or farming sector increases the strength of the whole region.

A study in Pennsylvania found that every dollar spent by a farmer generates $2.20 in local business.[35] If instead of sending $525 million (approximately 25 percent of the total $700 million goes to retailers and to transportation costs) to agribusiness in California and Florida, we sent out money to Maine farmers, it would be spent locally and put in local banks. So if, for example, we produced all our food within the state, an additional $1.16 billion worth of local business might be generated.

Maine is a relatively poor state, and some economists believe that it is the poorest state in the union when the cost of living is added in.[36] It may not be just a coincidence that Maine is probably one of the most "dependent" states in terms of food and energy. While we import 90 percent of our energy and 70 percent of our food, we export 70 percent of all products produced in the state.[7] In addition, little of this investment in transportation is benefiting Maine since 90 percent of all truckers hauling Maine agriculture products are based out of state.[16]

One does not need to be an expert in economics to recognize that these facts are major sources of our state's economic difficulties. And looking at these facts alone, one would wonder if Maine has grown past its infancy stage of being a colony of Massachusetts. These facts are perhaps only part of a larger picture in which economic opportunists on the outside have "used" our state as a source of raw materials and cheap labor. In recent years control by outside interests has increased rather than declined.

Traditional Maine businesses such as Decoster Egg Farms, Burnham and Morrill Company (B & M Baked Beans), Snow's Food Products (clam chowder), G. H. Bass Company (shoes), Oxford Paper and Bath Iron Works have been purchased by multi-national corporations.[36]

In trying to measure the real efficiency of such a system, one does not need to look past the plight of the small farmer or the small fisherman in Maine. In 1977 the per capita income in Maine was $5,098, only 81 percent of the national average. In that year, 35 percent of all Maine households had an income of less than $10,000. These figures which are lower than the national average, are even lower in fishing and farming sectors of the state. The Food and Farmland Study Commission found that in Maine those classified as small farms (gross income under $20,000) had an average net income from farming at the poverty level. Most Maine farmers are listed as part-time farmers who must supplement their income with other jobs. Aroostook County, the biggest farming region in the state, has not found agriculture to be particularly profitable: The 1977 per capita income there was substantially lower than the state average at $4,692. This region also experiences the highest unemployment rate (9.5 percent) and was the only county to experience net emigration (2,345 people) between 1970 and 1977.[37] The fishing industry is spread along the coastal counties which also do a good portion of the manufacturing in the state so meaningful figures are difficult to gather. However, unemployment has been a chronic problem among fishermen also.

IV. What Can We Do?

The trends of declining productivity and increasing dependence outlined in this report do present a gloomy picture -- one that should be of concern to all of us. However, there is an increasing amount of evidence to show that Maine food production may be at a turning point, that the trends are reversing and that we may have begun moving toward new ideals of sustainability and self-reliance. These good beginnings should give us hope, but if Maine is to transform its food system into an economically healthy and sustainable one, much effort and perseverence will be required.

It should be noted that although Maine has not lost as much acreage in farmland to development as many other states (Maine was among the five states that suffered the smallest loss of agricultural land from 1967-1977),[38] we have a comparatively small farmland resource base to begin with. Only nine states have a smaller cropland base.[39] Maine was also listed among the five states with the lowest percentage of land having potential for future conversion to cropland use.[38]

Since 1974, Maine has experienced an increase in number of farms and in farmland. This is an exceptional development since the U.S. as a whole has lost farms and farmland. The estimated number of farms has risen from 6,436 in 1974 to 8,300 in 1981,[2] many of these being small and part-time farms. At the same time total farmland in the state has increased from 1,523,696 to 1,615,000 acres.[40] There has been a recent resurgence in fresh vegetable and sheep farming. Many of the additional farms are the work of new immigrants to Maine. These people are generally young, highly educated, and come with an interest in resurrecting traditional values and activities.[7]

The fisheries also exhibit signs of revival. Since 1976, fin fish stocks off the coast of Maine have increased dramatically. While commercial fishery landings in Maine had steadily declined from 1950 to 1975, landings have increased from 100 million pounds in 1975 to 207 million pounds in 1980. These figures, however, are still somewhat below 1950 totals of 322 million pounds and do not include shellfish landings which have remained relatively steady throughout the period.[41]

It does look like Maine is already moving in some of the right directions towards a sustainable food system. However, before speculating on the extent to which Maine might become self-reliant, it is important to recognize that there are some important limitations to diversification of production in Maine. To begin with, Mainers must contend with a short growing season ranging from about 120 to 140 days. The cold climate combined with the problems of our soils, which are generally highly acidic and rocky, together with the problems of our terrain, which is generally irregular and poorly drained, have discouraged large-scale farming in the past. Due to climate, soils, and topography, there are a number of crops not suitable for growth in Maine using conventional agricultural techniques. However, Maine certainly could produce a larger quantity and a wider variety of food crops. A good place to begin might be with vegetables.

In Maine, we currently import over 80 percent of our vegetables.[8] To produce all our vegetables within the state would require about 32,000 acres -- 3.5 percent of our total cropland. The idea that Maine could grow more vegetables is not a hypothetical one -- in 1950 acreage in vegetable production was more than double the current acreage. Although not all crops can be grown in Maine, we could provide for most of our current vegetable consumption, and with some changes in diet could be totally self-reliant.

Changes in our diet would not have to be major ones. Using such methods as indoor propagation and transplanting, we could have a fresh supply of most vegetables for 4 to 6 months. Some crops -- including potatoes, carrots, onions, beets, cabbage, turnips and winter squash -- keep well in cold storage and could be available in their fresh form nearly all year. (See figure 6). Our existing 700 greenhouses could produce part of our out-of-season vegetable needs. And since 35 percent of our present vegetable consumption is either in the form of frozen (12 percent) or canned (23 percent) vegetables, we could grow and preserve much of these in Maine.

VEGETABLES FOR STORAGE

Beets. Pick mature vegetables before first killing frost. Pack in layers of damp sawdust or sand. Requirements: 32 to 40°F., 90 to 95 percent humidity. Life: 4 to 6 months.

Brussels sprouts. Harvest after a few mild frosts. Store in perforated plastic bags. Requirements: 32 to 40° F., 90 to 95 percent humidity. Life: 3 to 5 weeks.

Cabbage. Pick firm, solid heads, and trim off loose outer leaves. Place heads on shelves, string them up by the roots, or wrap in newspaper and store in boxes or bins. (Beware: cabbage emits a strong odor during storage.) Requirements: 32 to 40°F., 80 to 90 percent humidity. Life: 2 to 4 months.

Cabbage, Chinese. Store only mature, solid heads, picked before a severe frost. Store as with regular cabbage, or pack roots in damp soil or sand. Requirements: 32 to 40°F., 90 to 95 percent humidity. Life: 2 to 4 months.

Carrots. Dig before any hard freezes. Store in cartons of sawdust, sand, or leaves. Requirements: 32 to 40°F., 90 to 95 percent humidity. Life: 6 to 8 months.

Celery. Store in trenches in the garden, or place roots in boxes of sand or soil. Requirements: 32 to 40°F., 90 to 95 percent humidity. Life: 1 to 2 months.

Endive, escarole. Pick after moderate fall frosts. Store with roots in soil or sand. Requirements: 32 to 40°F., 80 to 90 percent humidity. Life: 2 to 3 months.

Garlic. After curing, store in paper bags, or braid into strings and hang from rafters. Requirements: 35 to 40°F., 60 to 70 percent humidity. Life: 6 to 8 months.

Horseradish. Dig anytime in fall. Store in damp sand or sawdust. Requirements: 32 to 40°F., 90 to 95 percent humidity. Life: 4 to 6 months.

Jerusalem artichokes. Mulch in garden or store in plastic bags or damp sand. Requirements: 32 to 40°F., 90 to 95 percent humidity. Life: 1 to 2 months.

Kohlrabi. Remove leaves and roots. Store in damp sand or sawdust. Requirements: 32 to 40°F., 90 to 95 percent humidity. Life: 2 to 3 months.

Onions. After curing, remove tops and store in bins or string bags, or braid and hang from rafters. Requirements: 35 to 40°F., 60 to 70 percent humidity. Life: 4 to 6 months.

Parsnips. Mulch in ground or store in damp sawdust, sand, or leaves. Requirements: 32 to 40°F., 90 to 95 percent humidity. Life: 4 to 6 months.

Potatoes, sweet. After curing, wrap individually in newspaper and pack in baskets, or pack loosely (make sure potatoes aren't touching) in cartons of sawdust. Requirements: 50 to 60°F., 60 to 70 percent humidity. Life: 3 to 5 months.

Potatoes, white. Late potatoes store best. After curing, pack in baskets or boxes. Don't store near apples, which give off a gas that promotes sprouting. Requirements: 32 to 40°F., 80 to 90 percent humidity. Life: 4 to 6 months.

Pumpkins. After curing, place on shelves or in boxes. Requirements: 50 to 60°F., 60 to 70 percent humidity. Life: 4 to 6 months.

Rutabagas. Dig after a few mild frosts. Store in damp sand, sawdust, or moss. Requirements: 32 to 40°F., 90 to 95 percent humidity. Life: 2 to 4 months.

Salsify. Mulch in garden, or store like parsnips. Requirements: 32 to 40°F., 90 to 95 percent humidity. Life: 1 to 2 months.

Squash, winter. After curing, pack on shelves or in boxes. Requirements: 50 to 60°F., 60 to 70 percent humidity. Life: 4 to 6 months.

Tomatoes, green. Pick mature green fruits before frost. They will gradually ripen at 55 to 70°F. Requirements: 50 to 60°F., 60 to 70 percent humidity. Life: 4 to 6 weeks.

Turnips. Harvest before a heavy freeze. Store like carrots. Requirements: 32 to 40°F., 90 to 95 percent humidity. Life: 2 to 4 months.

Figure 6

Before Maine farmers diversify their production, they will want to be assured of selling their produce at a fair profit. Consumer demand for locally-grown fresh produce may already far exceed current supply. At this point, more than anything, we need a marketing system in which the farmer can be sure of selling for a fair profit and in which the consumer can be assured of a reliable supply.

The evidence is clear that programs for growing and marketing produce locally benefit both the farmer and the consumer. The food is tastier and fresher and far less energy is consumed in getting it to the table. A United States Department of Agriculture study of direct markets in Colorado showed that local farmers received 44 percent higher gross returns than if they had sold through wholesale channels, while consumers got an average 28 percent discount compared to supermarket prices.[42] A New York City study showed that for consumers, price savings ranged from 7 to 35 percent.

Another approach to increasing our self-reliance is expanding the role of home gardens. Approximately 50 percent of the households in Maine currently have gardens, with the average size being 1,000 square feet.[16] This amounts to 4,200 acres of home vegetable production with an estimated annual value of over $8 million. If each of these 185,000 gardens produced 1,380 pounds of vegetables, they could provide all of Maine's vegetable needs (fresh, canned, and frozen). If each present gardener produced 884 pounds of vegetables, all of Maine's fresh vegetable needs could be provided. (These are not outrageous figures; many gardens produce more than this.) Or if all Maine's households had gardens that produced 690 pounds of food (the average U.S. garden in 1979 produced 545 pounds but was 33 percent smaller than the average Maine garden),[43,16] all the state's vegetable needs would be met. This won't happen, of course, but it helps show the significant contribution home gardens already make to the state's food supply, self-reliance and economy, and that there are even greater possibilities.

Another potential food source that can be directly tapped by the consumer is the abundant "wild food" resource in the state. Over 3.5 million pounds of venison and moose meat (dressed weight) were harvested by hunters in 1979.[44] Deer and moose harvests together accounted for more meat than either pork, veal or mutton produced in the state. In addition, there are game birds, fish, maple syrup, wild berries, fiddleheads, mushrooms, dandelion greens and other wild edibles available for the taking. Together, these represent a substantial contribution to our state food supply. They should be recognized as food sources and perhaps protected to ensure they remain as such.

An area in which Maine is almost being forced to become more self-reliant is its grain supply. We presently import nearly 100 percent of the grains used to feed livestock and humans in the state. The survival of our poultry industry depends upon finding reliable and economical sources of grain. With rising transportation costs and an expanding world population, the outlook is not good for finding such a source. There are, however, some alternatives.

Two ways that Maine could become more self-reliant are (1) by producing more grain or (2) by consuming less. In recent years, Maine farmers have increased acreage planted in corn and oats. However, the potential for grain production in Maine may be somewhat limited. Conventional methods require large inputs of fertilizers and pesticides. The relatively poor soils in Maine require larger fertilizer inputs than soils in the midwest to produce the same grain yield; thus large-scale grain-raising has not been economical here. And unless farming methods shift from chemical to biological agriculture, grain-raising would not represent increased self reliance; it would only cause our dependence to be shifted from grain inputs to chemical inputs. Although we probably will never produce grain at the rate we import it now, there is potential for some expansion. A likely niche for grain-raising might be as a rotation crop with potatoes. By rotating oats, wheat, buckwheat and legumes with potatoes we could increase our self-reliance and at the same time improve our soil, instead of losing it.

Much of the land in Maine is more suitable for growing hay or for pasture than for growing vegetables or grains. Maine can produce more protein per acre in grass than Iowa can produce in corn.[31] If Maine agriculture is to expand, we might be wise to increase our production of livestock that can subsist on these native feeds. Sheep and cattle can be raised almost entirely on grass and a large market already exists since we now import nearly 90 percent of our beef and lamb. It should be noted that range-fed beef is more efficient but a different tasting source of protein than the grain-fed beef currently raised in midwestern cattle lots. Although present grading standards and eating habits favor fattened feedlot beef, a strong case can be made for the health benefits of switching to range-fed beef. Maine could take a leading role in the Northeast in producing grass-fed livestock and promoting the nutritional, ecological and economic advantages of these products.

Our commercial fishery is another area in which we could benefit from some changes. Maine people consume less than 10 percent of the fish and shellfish landed in Maine, yet few of us are complaining of having too much seafood in our diets. Fish is expensive and except in coastal areas, difficult to obtain. That's no wonder, since much of our supply is shipped to Boston or Gloucester to be filleted and then returned to Maine for sale! Maine is gifted with an abundant fisheries resource; but before these resources can be utilized, we need to have well-equipped fishermen, fish-processing facilities and in-state marketing system. The fish stocks exist now. However, due to economic hardships, Maine fishermen generally lack adequate gear, boats and piers. There is relatively little fish-processing done in the state. If our fishing industry is to by stimulated, we must provide financial incentives to get it moving.

Another means of decreasing our food imports is by reducing the amounts of food and other organic materials that are lost as waste in our current food system. Just as conservation is a source of energy, it can be a source of food. About 20% of all food produced in this country is "lost" or "wasted", 39 percent of this amount occurs in the home.[45] Approximately 10 percent of all food bought by consumers is thrown out as garbage.[30] If we could eliminate food thrown out, we could maintain our present diet but save over 200 million pounds of food.

Losses occur at each stage of our food system: harvesting, transporting, storing, processing, wholesaling, retailing and in home preparation. The more a product is processed, the larger the percentage of loss. To deliver fresh potatoes, post harvest handling, storage and transportation result in a 10 percent loss. When potatoes are processed, the total loss can amount to 60 percent.[30] Higher food prices will certainly cause us to be more concerned about food that is lost. Higher prices will mandate the development of a more efficient distribution system. In general, the fewer stages in the system, the closer the place of production is to the place of consumption and the closer the finished product is to its natural state, the smaller the percentage of food that is wasted. Thus, in terms of food-use efficiency, the best food system is one in which the consumer is also the producer and the distance transported is no further than from the backyard to the supper table.

Some of the food that is discarded is not considered "fit" for human consumption (as economics change, we may become less demanding). However, given present eating habits, much of this food could be recycled back into the food system. For example, table scraps can be fed to hogs; in Maine, potato processing residues can be used as a livestock feed.

Since the processing of food generally causes a loss in mass and in nutritional value, rising food prices could make it prohibitive to process any of our potato crop. However, in the present system, approximately 25 percent of Maine potatoes are used for processing purposes.[16] Each year, our potato processing plants generate 312,000 tons of processing waste residues.[46] A good portion of these residues, which amount to the equivalent of 19,746 tons of dry matter or about $3 million in feed grain is dehydrated for use as cattle feed.[47] Much of the feed, however, is exported.

Unless they are dehydrated at a special processing plant, potato residues do have a limitation in their use for feed. The large bulk of such residues makes them an economical feed only if they can be utilized near the site at which they are produced. This limitation points to the desirability of a more integrated (less specialized) food production system in which livestock would be raised near the site of crop production and processing.

This sort of integration also would be beneficial to the large-scale implementation of another means of reducing waste in our food system. Maine livestock and poultry produce 850 million pounds (dry weight) of manure each year.[48] Little of this is used as fertilizer. Yet in 1979 we used 110,028 tons of chemical fertilizer, much of it from Florida, New Mexico and Canada.[1] Thus, utilization of manures (both animal and human) represents a readily available way of increasing self-reliance. However, like potato residues, manures are bulky. At 1978 fertilizer prices they were economical only if transported less than three miles.[31] Use of manures rather than chemical fertilizers also involves increased labor and application costs.

Still, the economies of biological farming are changing and each year the livestock, poultry and humans in Maine do produce 78 percent of the nitrogen, 59 percent of the phosphates and 57 percent of the potash fertilizer presently required by Maine agriculture.[49] This is equivalent to more than $3 million worth of chemical fertilizer.[50] Much of this could be converted into usable commercial products.

Could Maine have a totally self-sufficient food system? Not with our present diet. We cannot grow such things as oranges, bananas, rice, sugar cane, peanuts, coffee, tea and cocoa. Our current acreages of crop and pastureland are not sufficient to produce both the meat and food crops we eat. And it is questionable whether complete self-sufficiency is a worthwhile goal in itself. Perhaps moves to increase self-sufficiency should be based on the goals of reducing food costs, averting the risk of supply unavailability when that is unacceptable, and increasing the viability of the Maine economy.

But given the vulnerability of our food supply, the growing global demand for food, and the economic and nutritional advantages of eating locally produced food, it is clearly desirable for Maine to increase its self-reliance. Likewise, individuals and regions throughout the world will find it beneficial to move toward self-reliance in terms of food. It would not be difficult for us to produce substantially more of our vegetables and range-fed livestock and to increase our production of grains, fruits and legumes while at the same time decreasing our dependence on imported agricultural inputs.

With the continuation of certain trends of change in our food consumption patterns we could greatly increase our self-reliance. For example, annual beef consumption has dropped in recent years (it was 98 pounds per person in 1976 and 80 pounds per person in 1979).[51] It is not hard to see why beef is so expensive -- given that we import about 90 percent of it, and that current beef production is very energy intensive. What other foodstuffs will follow in the economic footsteps of beef? What other foodstuffs will Mainers no longer be able to afford to import?

There are a number of alternatives to continuing our expensive addiction to imported beef, pork and mutton. One option is to expand our production of sheep and cattle which can thrive on locally produced feeds and pasture. This would enable us to switch our consumption of inefficient feedlot beef to range-fed livestock. Orienting our diet toward foods that are currently produced in Maine is another alternative. By substituting fish and shellfish for beef and pork, we could decrease our imports and probably become healthier at the same time. Fish is plentiful (Maine fishermen landed 217 pounds of fish and shellfish for each state resident last year) as well as nutritious, generally containing more protein per calorie than beef or pork. There are other substitutions that we might make. We could replace a good portion of our exotic imports with such locally produced staples as chicken, eggs, potatoes, apples and blueberries and not necessarily lose in nutrition or taste appeal.

Some of us have developed psychological needs for certain foods. For example, we feel we must drink orange juice to get enough vitamin C. However, many other foods have the same nutrient. Two potatoes have as much vitamin C as one orange. The total vitamin C content in commercially grown Maine blueberries is equivalent to that in 21,526,000 Florida oranges. Many of us would enjoy spooning up a bowl of blueberries instead of having a glass of orange juice for breakfast. Yet, every year we export 20,000,000 pounds of blueberries and import 26,000,000 pounds of oranges and orange juice.[8]

Even with our present diet, we can move much closer to self-reliance. To meet all our food needs, with the exception of the items that cannot be grown here, would take approximately 1.9 million acres.[8] We presently have 1.6 million acres of farmland, with 55 percent of that amount being cropland. In order to produce virtually all of our grains, legumes, vegetables, non-citrus fruits and sugar, we would only need 17 percent of our cropland (154,000 acres). If we grew all of these foods in the state, we would still have 753,000 acres of cropland and 249,000 acres of pasture left for livestock production! However, this remaining acreage would not be sufficient to raise all the livestock and animal products we presently consume. Just to raise all our beef locally would require 545,000 acres. 753,000 acres would be enough to provide our present consumption of pork, lamb, poultry, eggs and dairy products. If all Maine farmland was used to produce products for in-state use (rather than export), we could reduce our imports to less than 45 percent.

There probably is no single ideal strategy for the utilization of Maine farmland. Changing production costs and consumption trends make the ideal strategy a constantly changing one. One must be cautious in making generalizations about optimal land use. For example, while studies have shown that it takes ten times more space to produce a pound of beef than to produce a pound of chicken, if a particular farm has only pastureland, it might be more efficient (and better for the soil) to produce grass-fed livestock than to produce corn for poultry feed.

There will always be foods that are not produced in Maine. However, many of these foods could be efficiently grown in other states in the Northeast. In addition, Maine probably will always find that it can easily produce surpluses of several foods. We currently produce large amounts of fish, potatoes, poultry, eggs, and apples which are distributed throughout the Northeast. Many of the Northeastern states have larger populations in proportion to farmland; they will find it more difficult to become self-reliant. These factors all point to the desirability of a regional food system and of greater regional self-reliance. We may find it in the best interest of the state and of the Northeast to become a regional supplier of a few goods. In return, we might rely on areas in the Northeast for commodities less suitable for Maine climate and soils. Whatever system we do develop, we need to carefully weigh differences in production efficiency between regions with transportation costs and with considerations for long-range efficiency in terms of our economy and our environment.

RECOMMENDATIONS FOR CHANGE

What can we do in order to bring about a transition to a more sustainable, self-reliant food system with its accompanying economic and nutritional benefits? There is no single, simple answer to this immense, complex question. Because the Maine food system is touched by everything from the California food producer, fast-food restaurant, grocery store, food broker and warehouser to the backyard garden and family dinner table and is affected by everything from federal, state and city government policies to business decisions to neighborhood and consumer organizations to individual actions, any thoughtful response has to be on a variety of different levels. There are responses that are appropriate for government decision-makers, and there are other responses needed from business, from the community, and from individuals.

It is not feasible in this report to trace out all our possible options. What is feasible though, is to point out that: 1) a state plan for our food system is sorely needed which would enable us to increase our self-reliance and economic viability while also decreasing the potential for disruption; and 2) an emergency state plan for feeding Maine people during a supply disruption is crucial and given the current state of international affairs, national economy and state vulnerability, not to formulate one soon would be irresponsible; and 3) the Maine consumer can take a more active role in his or her own food system that will make our food system more economical.

This report concludes with The Cornucopia Project's recommendations in these three areas.

1. State plan for Maine's food system:

A state food plan for Maine needs to incorporate measures which will realize the following broad policy objectives.

A. INVENTORY, MAP AND PROTECT ALL REMAINING PRIME FARMLAND FROM DEVELOPMENT AND SPECULATION.

The soil conservation service is in the process of publishing prime farmland maps for the state. These maps will be used by a Maine Department of Agriculture task force to recommend legislation to protect farmlands. An inventory of farmlands would ideally include identification of all agricultural lands, their potential, their current status and their likely availability for new farmers or farming ventures.

Preserving our remaining prime farmland by protecting it from development and speculation can and perhaps needs to involve a myriad of state and local policies that cover a spectrum of tax incentives and penalties, inheritance laws and local ordinances.

The Cornucopia Project has an ongoing task force engaged in making a comprehensive inventory of programs that other states, countries or research organizations have either instituted or proposed to deal with similar problems. This listing of options will be sent to anyone wishing a copy. One option that could be used in Maine is currently used in France, where owners of farmland within designated districts must, by law, notify a state-chartered non-profit corporation of their intention to sell their land. The corporation has the right to buy the farmland within 30 days. Capitalized by the government, these corporations function as revolving funds, reselling the land to farmers who will commit their land to commercial farming. Essentially, the state has "first refusal" rights to all agricultural land sold. Other strategies include tax changes that modify tax assessments of farmland to reflect current use value, the institution of capital gains tax on land sales and speculation, the establishment of a "circuit breaker" tax which allows farmers to reduce their total tax load when property taxes exceed a certain percentage of their total income (with farmers signing a contract that assures that their land use does not change), the establishment of property tax at the time of sale of farmland that will stay the same until the property is sold again, and the institution of a heavy tax on profits made on the development of previously agricultural land. Yet other options include state or municipality purchase of development rights from farmers (along with the resale or lease with restrictions on use), the establishment of a development permit system, tax incentives for farmland owners to voluntarily restrict development of their prime agricultural lands, state imposed agricultural zoning, voluntary agricultural districting (in use in New York) which provides substantial benefits to farmers, including freedom from being assessed for special services such as water, sewage, drainage, sanitary landfill, etc. and the "right-to-farm" principle, which provides that municipal ordinances may not prohibit normal farming practices. Additional options include the transfer of development rights, cluster development and "agricultural open space preserves" where each municipality would be required to designate an agricultural preserve within its boundaries composed of at least 70 percent of its prime farmland.

B. PRESERVE OUR SOIL BY INSTITUTING WIDESPREAD AND EFFECTIVE SOIL CONSERVATION PROGRAMS WITH STRONG INCENTIVE AND ENFORCEMENT PROVISIONS.

The options in The Cornucopia Project's overall list that could be used in Maine include tax incentives for soil conserving measures, such as investing in minimum-tillage equipment, refraining from fall plowing and using contour plowing, "conservation achievement contracts" whereby farmers would be provided with annual payments determined by the amount of reduced erosion achieved, taxes on each ton of soil lost from agricultural land, the prohibition of all agricultural production activities which result in more than five tons of soil loss per acre per year, the linking of commodity support programs to soil conservation programs, and the linking of state purchase of farm commodities to soil conservation programs.

C. DEVELOP INCENTIVES FOR FARMERS TO PRODUCE A GREATER DIVERSITY OF CROPS FOR LOCAL CONSUMPTION.

Many exciting things are already happening in Maine food production. Much is currently being done in the area of marketing, especially direct farm marketing and the promotion of local agriculture. The Maine Department of Agriculture, which has been renamed the "Department of Agriculture, Food and Rural Resources," is encouraging farmland preservation, diversification of production and the development of marketing systems. An institutional purchases law in which in-state producers receive preference in bidding for sale of foodstuffs to state institutions has been passed. The Department of Agriculture also has a promotional program with a logo campaign ("Maine Produces") to identify Maine products and to encourage support for local growers and producers.[52] Farmer's markets and roadside stands seem to be increasing in number each year. A 1980 directory issued by the Maine Department of Agriculture listed 22 farmers markets and over 200 roadside stands in the state.[53] Efforts are being made to get more local produce into local supermarkets. Last year there was a government-funded experiment in which a group of Waldo County vegetable growers provided large quantities of vegetables to the state's major wholesaler. Despite these advances, we have a long way to go. A recent report on Maine agriculture warns us:

"If competitive market conditions and not a concerted food policy dictates where expansion occurs, it will not be surprising to find a large proportion of new production going into exports, rather than supplying local consumers."[33] These programs are good beginnings and only need to be greatly expanded and fine-tuned.

Other options and/or strategies for improving the marketing system to strengthen regional agriculture include "forward contracts," which are agreements regarding delivery and acceptance of a specified commodity at some future date. A mandatory market reporting system would provide information necessary for decision making and identification of market alternatives. Grading standards should be revised to reflect nutritional status, product end uses, maturity and eating quality, rather than external appearances. The establishment of regional warehouses and storage facilities with efficient transport systems to move goods from the farm to the distribution center could be instituted. Public funds could be used to help establish the centers which would then be self-supporting through fees paid by producers. These centers would grade, pack and distribute the output of small local producers and provide large buyers with volumes and specifications they demand.

The dairy industry already has an extensive marketing system established which makes dairying attractive to farmers since they are assured of both a market and a stable income as a result of the associated support system. Programs set up for other farm products would provide incentives for a more diversified agriculture, and would create stability for smaller-scale operations.

Other options include electronic markets which centralize price negotiation, allow for direct marketing but include the advantages of pricing accuracy normally associated with larger markets, and a forward deliverable contract market which could achieve the benefits of open market trading along with the benefits of contracting. Exclusive agency bargaining, vertical integration through ownership, joint ventures between agricultural cooperatives and agribusiness marketing firms, marketing orders, and marketing boards are all potentially viable alternative marketing strategies as well.

Alternatives for marketing cull cows and dairy calves have also been suggested in a USDA report focused on the Northeast. These include regional auction market centers, regional electronic exchange, a combination regional market center-electronic exchange, and contract sales to packers.

Some other options that might work in Maine include tax incentives for small scale food producers (such as not taxing the first $10,000 of income from food produced for local consumption), tax incentives for local direct markets, incentives for attracting food processors to Maine who wish to reduce transportation costs by locating near a major distribution center, mandating the use of public farmlands for the production of crops for local consumption, instituting a more extensive program promoting and advertising state-grown products (to counter promotional programs out-of-state concerns), developing tax incentives for the purchase of local products by major distribution channels, assisting small growers through a state-wide marketing clearinghouse, encouraging expansion of on-farm processing, cooling and fresh packing of local food crops, and developing consumer education programs to increase consumer awareness of locally-grown produce.

D. PRESERVE AND STRENGTHEN OUR FISHERIES

There are three basic areas in which we could improve our fisheries. One area includes measures that would ensure a self-renewing fisheries resource such as stricter laws regulating dumping of pollutants in marine waters, developing statewide resource surveys for monitoring and prediction of stocks, alleviating the problem of stock depletion by regulating annual harvests according to resource surveys and developing less destructive harvesting techniques for shellfish. Another group of options includes measures to provide the financial assistance to fishermen so that we can efficiently utilize the annual growth in fish stocks. Ways of doing this include providing funds for construction of adequate fish piers to handle larger, off-shore vessels and supporting experimentation with aquaculture projects for different species of shellfish. A third group of measures, developing a marketing system tailored to the needs of the fisherman as well as the consumer, is needed to complement previously described options. We might do this by developing fisherman-to-consumer marketing channels through dockside fish markets and public fish auctions; promoting seafoods through consumer education on purchasing, preparing and the nutritional value of specific fish and shellfish species; funding the investigation of inland market options for Maine surpluses and by providing incentives to keep local seafood processors in business and to increase the proportion of fish landings being processed and marketed within the state.

E. CONSERVE ENERGY AND NATURAL RESOURCES

Options in this area include developing incentives and methods for using local organic wastes such as leaves, brush, sewage sludge, seaweed, etc., for fertilizer, developing incentives for water conservation measures, such as investment tax credits for drip irrigation equipment and cisterns, developing incentives for increasing the production of energy from agricultural lands in ways consistent with soil and water conservation principles, providing investment credits for construction of energy conserving barns, greenhouses, fishing vessels, etc., and establishing an Agricultural Waste Council in the Maine Department of Agriculture to develop desirable legislation and other measures to facilitate the recycling of organic wastes.

F. REORIENT STATE RESEARCH TO FOCUS MORE ON SUSTAINABLE FARMING METHODS, SUSTAINABLE FISHING METHODS AND ON LOCAL FOOD PRODUCTION.

Options in this area include the granting of additional funds to Maine's land grant university or reorienting existing research funds in these directions.

G. PRESERVE AND STRENGTHEN SMALL-SCALE FOOD PRODUCTION.

Ways to do this might include providing guaranteed state loans to beginning farmers with deferred or reduced payments until five years after start-up (as is being done in Minnesota), increasing support for direct farmer-to-consumer marketing channels, providing on-farm summer work opportunities for young people interested in learning about farming, developing a rural education center such as the one recently proposed (see Maine Organic Farmer and Gardener, Feb. 1981), developing "entry packages" for new farmers that would include help in obtaining the needed quantities of land, capital, agronomic advice along with managerial/organizational assistance, and developing a consulting program using retired farmers and others who may or may not have been in agriculture (e.g. financial specialists and accountants) to provide assistance to farmers who need managerial advice beyond or different from the capabilities of the USDA service. Each of these strategies could also be used to assist beginning fishermen and to support small and part-time fishing operations in the state.

H. DEVELOP REGIONAL AND COMMUNITY FOOD PLANS.

One possibility here is to borrow a technique currently used in China, where cities are organized around their respective food systems. In this system, a city's boundaries will include enough farmland to make the city as self-sufficient as possible. If the city gets more people, it expands its jurisdiction over more surrounding farmland to make sure it can feed itself. Other options include establishing incentives for cities and neighborhood organizations to increase local food production, processing and storage centers, as well as contracting with local farmers to supply their foodstuffs (currently being done in Japan), and revising zoning ordinances to allow more agricultural practices in residential areas. Yet another option in this area would be establishing a state or regional Food Industry Development Institute or TVA type of organization that could deal comprehensively with a region's food system.

2. Emergency State Food Plan:

An emergency state food plan for Maine needs to incorporate measures which will deal with the following contingencies:

A. A complete oil cutoff to the United States from all OPEC countries.

B. A multi-year drought in Maine's present day major food supply areas.

C. A near shutdown for one to four weeks of the U.S. trucking and rail system.

D. A widespread labor dispute in Maine's present-day major food supply centers that could cut off the flow of food into Maine.

E. An extraordinary leap in food prices so that only the wealthiest people in Maine could afford food.

Some options Maine has for dealing with such contingencies include the establishment of state or regional grain storage facilities, the encouragement of home, community and city storage of basic foodstuffs, the formation within our current Civil Defense organization of state-wide communication and coordination centers for dealing with a food emergency, and the general encouragement, expressed in all the above measures of producing more and more of Maine's food within Maine.

3. Maine Consumer Activities

There are a wide variety of options available that will help the Maine consumer deal with the increasing price of food and the vulnerability of our supply.

These options include tax and other incentives for increasing the local production of food by expanding home gardens, producing food in the winter with small scale greenhouses or "growth frames," producing food in the winter in larger greenhouses or "sunspaces" that can be added on to existing houses, producing protein with small-scale fish, rabbit or quail-culture, increasing utilization of "wild" food resources by state residents, processing and storing more food at home and selectively buying foodstuffs in large quantities when they are in season and then preserving them, and practicing "food conservation" by utilizing all food, either for human consumption, animal consumption or compost.

Putting the most appropriate of these measures into practice would ensure us of having a more sustainable food system and a more secure food supply while at the same time greatly increasing Maine's food self-reliance and economic viability. Without changes, Maine agriculture will either continue to produce for export or fail to produce at all. Neither outcome does much for our food security. Neither outcome will ever be profitable for Maine people. On the other hand, a move toward food security and toward more regional self-reliance in food will improve the state's economic health.

The problems afflicting our food system are real, and they are growing each day. But there are solutions, and we still have the time to make changes. With careful planning and action, we can develop a system that will improve our food supply, our environment, and our economy. If Maine is truly concerned about the condition and future of its food system, then the state must be willing to spend the time and money to see this plan modified, accepted and implemented. The time to begin is now.

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Division of Market Development
Maine, Dept. of Agriculture, Food and Rural Resources
Station 28
Augusta, Maine 04333
Phone: (207) 289-2163

Figure 7

MAINE FOOD IMPORTS

(As Determined By Food Production and Consumption By Weight and Retail Value)

OMMODITY	PRODUCTION		CONSUMPTION					
	Retail Weight[a] (1,000 lbs.)	Retail Value[b] ($1,000, 1980$)	Retail Weight[c] (1,000 lbs.)	Retail Value ($1,000, 1980$)	Amount Imported (% of Consumption)	Amount Exported (% of Production)	Retail Value of Imports(-)Exports(+) ($1,000)	Land Required to Produce 100% of Consumption[d] (Acres)
eats								
Beef	9,424.78	21,922.03	89,470.4	208,108.15	89.5		186,256.79-	545,836.
Veal	1,336.20	4,005.93	1,798.4	5,391.60	25.7		25,434.77-	5,000.
Lamb & Mutton	173.58	457.75	1,461.2	3,593.09	87.7		3,151.14-	12,900.
Pork	2,516.80	3,430.40	72,610.4	98,967.98	96.5		95,504.10-	101,700.
airy Products								
Fluid Milk, Cream	510,400.0	122,496.0	331,074.2	79,457.81		35.1	43,038.19+	294,700.
Condensed Milk	0.	0.	4,833.2	3,141.58	100.0		3,141.58-	21,800.
Dry Milk	0.	0.	7,980.4	12,289.82	100.0		12,289.82-	54,000.
Cheese	18,000.0[e]	18,360.0	24,952.8	41,172.12	27.9		22,812.12-	139,900.
Ice Cream	29,576.0	22,182.0	21,131.2	15,848.40		28.5	6,344.05+	48,200.
LL DAIRY PRODUCTS (fluid wt.)	638,000.0	163,038.0	953,725.24	151,909.73	33.1		11,138.72	558,600.
oultry & Products								
Chicken	265,555.44	180,577.70	57,886.0	39,362.48		78.2	141,215.22+	162,000.
Turkey	27.52	27.96	11,352.4	11,534.04	99.7		11,506.04-	57,900.
Eggs	251,985.0	158,750.55	40,239.2	25,350.70		84.0	133,399.85+	92,500.
ish (live weight)								
Lobster	21,981.0	91,001.34[g]	NC					
Scallop	3,233.0	21,790.42	NC					
Clams	5,676.0	25,201.44	NC					
Sea Herring	107,823.0	40,472.74	NC					
dab (Flounder)	14,553.0	41,330.52	NC					
Ocean Perch	13,805.0	28,300.25	NC					
Haddock	7,107.0	19,473.18	NC					
Cod	11,359.0	18,628.76	NC					
Grey Sole (Flounder)	3,601.0	14,367.99	NC					
Pollack	12,855.0	14,654.70	NC					
LL FISH (edible weight)	145,640.4[f]	410,705.93	14,162.4	39,827.5		90.3[h]	370,878.43+	
ats & Oils								
Butter	NC		5,170.4	9,461.83				51,700.
Lard	NC		2,922.4	2,016.46				
Margarine	0.		12,926.0	5,041.14			5,041.14-	
Shortening	0.		21,243.6	19,756.55			19,756.55-	
Oils	0.		25,964.4	21,550.45			21,550.45-	135,372.[i]
weeteners								
Refined Sugar	0.		102,396.4	5,198.20	100.		51,198.2 -	21,333.[j]
Corn Sugar	0.		4,383.6	2,980.85	100.		2,980.85-	
Corn Syrup	0.		44,905.6	30,535.81	100.		30,535.81-	
Maple Syrup	98.27	108.2	112.4	122.52	11.7		13.69-	
Cane Molasses	0.		224.8	346.19	100.		346.19-	
Honey	170.0	204.0	1,461.2	1,753.44	88.4		1,550.04-	NA[k]
egetables, Fresh								
Potatoes	2,496,000.0[l]	648,960.0	56,986.8	14,702.59		97.7	634,143.43+	2,374.
Lettuce	NC		27,987.6	15,449.15				2,218.[m]
Cabbage	NC		9,104.4	2,185.06				455.
Tomatoes	NC		12,139.2	21,688.70				1,444.
Sweet Corn	NC		7,643.2	2,835.63				1,318.

Figure 7

COMMODITY	PRODUCTION Retail Weight (1,000 lbs.)	PRODUCTION Retail Value ($1,000, 1980$)	CONSUMPTION Retail Weight (1,000 lbs.)	CONSUMPTION Retail Value ($1,000, 1980$)	Amount Imported (% of Consumption)	Amount Exported (% of Production)	Retail Value of Imports(-)Exports(+) ($1,000)	Land Required to Produce 100% of Consumption (Acres)
Snap Beans	NC		1,461.2	968.78				395.
Onions	NC		12,476.4	3,701.33				499.
Celery	NC		7,868.0	3,375.37				196.
Carrots	NC		6,631.6	2,180.42				265.
Sweet Potatoes	0.		4,496.0	1,095.90			1,095.90-	NC
Cucumbers	NC		4,383.6	1,814.81				626.
Peas	NC		NC					NC
Squash	NC		NC					NC
Peppers	NC		3,596.8	2,413.45				514.
Mushrooms	NC		3,034.8	3,611.41				
Asparagus	NC		337.2	333.83				367.
Artichokes	0.		449.6	159.61			159.61-	NC
Broccoli	NC		1,461.2	1,300.47				290.
Cauliflower	NC		1,348.8	714.86				135.
Spinach	NC		449.6	355.18				72.
Garlic	NC		1,011.6	778.93				101.
Eggplant	NC		674.4	330.46				48.
Vegetables, Frozen								
Asparagus	0.		89.9	231.94			231.94-	97.
Snap Beans	NC		1,382.5	1,258.08				434.
Lima Beans	0.		573.2	527.34			527.34-	330.
Carrots	0.		1,225.2	1,134.36			1,134.36-	97.
Peas	4,400.0	3,520.0	1,955.8	1,564.64		55.6	1,955.36+	698.
Broccoli	0.		1,539.9	1,447.51			1,447.51-	306.
Brussel Sprouts	0.		326.0	293.4			293.4 -	36.
Spinach	0.		820.5	506.71			506.71-	131.
Southern Greens	0.		1,315.1	815.36			815.36-	NC
Cauliflower	0.		562.0	533.90			533.9 -	130.
Corn	0.		1,157.7	810.39			810.39-	526.
Onions	0.		843.0	708.12			708.12-	34.
Potato Products	NC		20,344.4	12,613.53				1,628.
Vegetables, Canned								
Asparagus	0.		337.2	519.29			519.29-	366.
Sh. Beans	5,250.0	3,412.5	449.6	292.24		91.4	3,119.03+	375.
Snap Beans	3,000.0	869.93	6,744.0	1,955.76	55.6		1,087.40-	2,108.
Carrots	0.		562.0	224.8			224.8 -	28.
Peas	0.		3,596.8	1,115.01			1,115.01-	1,285.
Pumpkin/Winter Squash	7,950.0	2,591.7	674.4	219.85		91.5	2,371.41+	77.
Spinach	0.		899.2	467.58			467.58-	75.
Whole Tomatoes	0.		6,519.2	2,346.91			2,346.91-	736.
Catsup, Tom. Paste	0.		16,298.0	11,897.54			11,897.54-	7,212.
Tom. Puree, Pulp	0.		899.2	404.64			404.64-	189.
Tom. & Veg. Juices	0.		3,147.2	849.74			849.74-	321.
Beets	0.		1,124.0	422.62			422.62-	62.
Corn	0.		6,182.0	2,410.98			2,410.98-	2,810.
Pickles	0.		9,666.4	6,669.82				NC
Coleslaw/Sauerkraut	960.0	447.36	1,461.2	680.92				130.
Sweet Potatoes	0.		1,236.4	952.03			952.03-	NC
ALL VEGETABLES (Excl. Potato)	49,836.0ⁿ	27,409.8	198,487.0	118,906.36				29,164.

Figure 7

COMMODITY	PRODUCTION		CONSUMPTION		Amount Imported (% of Consumption)	Amount Exported (% of Production)	Retail Value of Imports(-)Exports(+) ($1,000)	Land Required to Produce 100% of Consumption (Acres)
	Retail Weight (1,000 lbs.)	Retail Value ($1,000, 1980$)	Retail Weight (1,000 lbs.)	Retail Value ($1,000, 1980$)				
Fruits, Fresh								
Apples	86,000.0	26,660.0	18,658.4	5,846.30		78.3	20,875.90+	1,756.
Peaches	8.0	4.0	7,755.6	3,893.31	99.9		3,889.42-	982.
Pears	10.0	6.9	2,810.0	1,958.57	99.6		1,950.73-	407.
Strawberries	NC		2,023.2	1,493.12				405.
Blueberries	21,190.0^{o}	13,773.5	146.12	94.98		99.3	13,678.52+	137.
Bananas	0.		24,053.6	6,013.40			6,013.40-	
Grapes	0.		3,484.4	3,578.40			3,578.40-	1,088.
Plums/Prunes	NC		1,910.0	458.70			458.70-	294.
Pineapples	0.		1,461.2	463.69				
Cherries	NC		674.4	709.47			709.47-	710.
Melons	NC		21,918.0	1,753.44			1,753.44-	2,739.
Oranges	0.		13,712.8	5,463.69			5,463.69-	
Tangerines	0.		1,686.0	843.0			843.0 -	
Lemons	0.		3,259.6	2,363.21			2,363.21-	
Grapefruit	0.		8,317.6	2,686.58			2,686.58-	
Other Citrus	0.		1,124.0	1,067.80				
Fruits, Processed								
Dried Fruit	0.		3,473.2	4,376.23			4,376.23-	4,668.
Frozen Fruit	0.		13,836.0	13,836.0			13,836.0 -	
Canned Juice	NC		25,694.6	9,250.06				NC
Canned Fruit	NC		31,805.6	7,850.02				NC
Grains								
Wheat Flour	0.^{p}		127,012.0	21,592.04	100.		21,592.04-	63,506.
Wheat Cereal	0.		3,259.6	1,662.40	100.		1,662.40-	1,630.
Pasta Products	0.		7,980.4	3,511.38	100.		3,511.38-	3,990.
Buckwheat	4,080.0^{q}	3,468.	NC			100.	3,468.0 +	NC
Rye	0.		899.2	449.60	100.		449.60-	357.
Oats	0.		3,596.8	2,445.82	100.		2,445.82-	1,938.
Barley	0.		1,348.8	822.77	100.		822.77-	1,879.
Rice	0.		10,340.8	5,584.03	100.		5,584.03-	
Corn Meal	0.		8,654.8	3,981.21	100.		3,981.21-	4,876.
Corn Cereal	0.		2,585.2	2,947.13	100.		2,947.13-	1,429.
Hominy, Grits	0.		4,720.8	1,982.74	100.		1,982.74-	533.
Corn Starch	0.		2,135.6	1,452.21	100.		1,452.21-	NC
Legumes, Nuts								
Dry Beans	2,760.0^{r}	1,821.6	7,193.6	4,747.78	61.6		2,924.63-	4,937.
Soybeans	0.		2,248.0	899.2	100.		899.2 -	2,135.
Dry Peas	NC		449.6	175.34				300.
Peanuts	0.		7,980.4	17,477.08	100.		17,477.08-	
Tree Nuts	0.		2,023.2	6,474.24	100.		6,474.24-	
Coconut	0.		562.0	1,405.0	100.		1,405.0 -	
Beverages								
Coffee	0.		8,542.4	26,993.98	100.		26,993.98-	
Tea	0.		786.8	4,579.18	100.		4,579.18-	
Cocoa	0.		2,922.4	11,309.69	100.		11,309.69-	
TOTALS	3,974,818.99	$1,665,332.24	2,102,937.76	$1,056,910.67			$ 690,449.12- $ 1,374,487.39+	1,877,065.

Retail Value of Maine Production	$1,665,332,240
Retail Value of Maine Exports	$1,374,487,390
Value of Production Remaining in Maine	$ 290,844,850 = 27.5% of Total Maine Food Consumption

Maine imports 72.5% of its food.

[a] Using U.S. Dept. of Agriculture, Agricultural Statistics 1980, production figures for 1979; USDA conversion figures.

[b] Prices supplied by Lewiston Daily Sun Foodbasket Feb. 1981; U.S. Dept. of Labor, Average Retail Prices for the Northeast.

[c] Using per capita consumption figures, USDA Food Consumption, Prices and Expenditures Feb. 1981 and 1980 Maine population, 1,124,000.

[d] For beef: William Lockeretz, Agricultural Resources consumed in Beef Production 1975; Other commodities: G. Burrill, J. Nolfi Land, Bread and History 1976.

[e] Cheese produced in Maine is "soft" (cottage) cheese. Per capita consumption of milk in Maine is 137 qts. (highest in U.S.).

[f] Fish Production: Maine Dept. of Marine Resources, Landings by commercial marine fishermen 1980, edible weight (0.6 x primary live weight). Assumes all fish for human consumption.

[g] Fish retail prices: supplied by Nick Alfiero of Harbor Fish (Portland, ME), averages of year 1980 prices.

[h] Tourists in the state of Maine consume 15% of total Maine landings (residents consume 10%) Robert Lewis, Dept. of Maine Resources. Amount exported is less than 90%.

[i] Acreage in soybeans required if all oil used is soy oil.

[j] Acreage in sugar beets at yields of 4,800 lbs. refined sugar per acre.

[k] To supply consumption, 42,000 bee colonies of average size (ME now has 5,000) would be required

[l] Total production for fresh and processed vegetables, excludes produce of home gardens. Maine Dept. of Agriculture figures used when available.

[m] Greenhouse acreage for lettuce consumption is 874,612.5 sq. feet at 4 harvests per year, 8 lbs./sq. ft.

[n] Estimate based on total acreage in vegetables (fresh and processing excluding potato) in 1978: 11,587 acres.

[o] Over 90% of blueberry crop is processed into frozen blueberries, Anr Isnal Univ. of Maine at Orono.

[p] Maine had 44,000 acres corn for silage; 7,000 acres corn for grain; 1,500 acres wheat, 42,000 acres oats, 214,000 acres hay for livestock feed (1980).

[q] Buckwheat produced in 1980 was exported to NY state for human consumption.

[r] Estimate derived from information by Herbert York, Maine Bean Grower's Association.

NC: Figures not collected for these commodities. Production is very small or none.
NA: Not Applicable.

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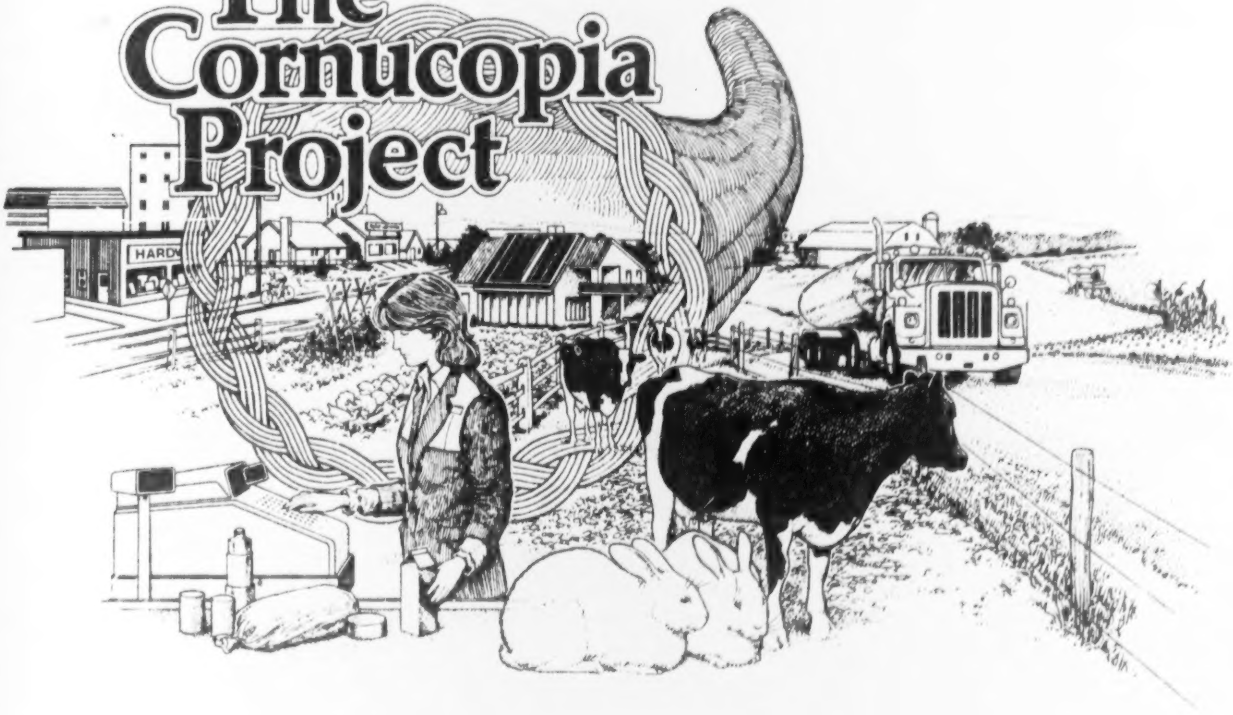
The Cornucopia Project
HARD

THE NEW YORK STATE FOOD SYSTEM: GROWING CLOSER TO HOME

A study of the food system of New York State by
PATRICIA MESSING
with

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1981

CONTENTS

I. Introduction 1

II. What's The Trouble? 3

III. How Did This Happen? 5

IV. What Does Food Dependence Mean? 6

V. What Can We Do? 8

VI. Recommendations For Change 14

Notes 24

CHARTS

No. 1 - Number of Farms and Land in Farms 2

No. 2 - Vegetables for Storage 10

Insert - New York State Food Imports

Introduction

When George Washington foresaw New York State as the "seat of the empire,"[1] he was undoubtedly impressed with its excellent location and rich natural endowments. To early settlers, the New York region -- a highly diversified terrain with wooded hills and fertile valleys, numerous lakes and rivers, and miles of coastline -- must have promised almost boundless productivity.

In many ways this great promise has been fulfilled. New York City is the commercial center of the world. New York State is the second most productive agricultural state in the Northeast, ranking just behind Pennsylvania in cash receipts from farming.[2] Agriculture is the state's largest industry, generating about $8 billion annually.[3] The dairy industry accounts for about 60 percent of the total cash for state farm products,[4] followed by cattle and calves, apples, greenhouse and nursery plants, and eggs.[5]

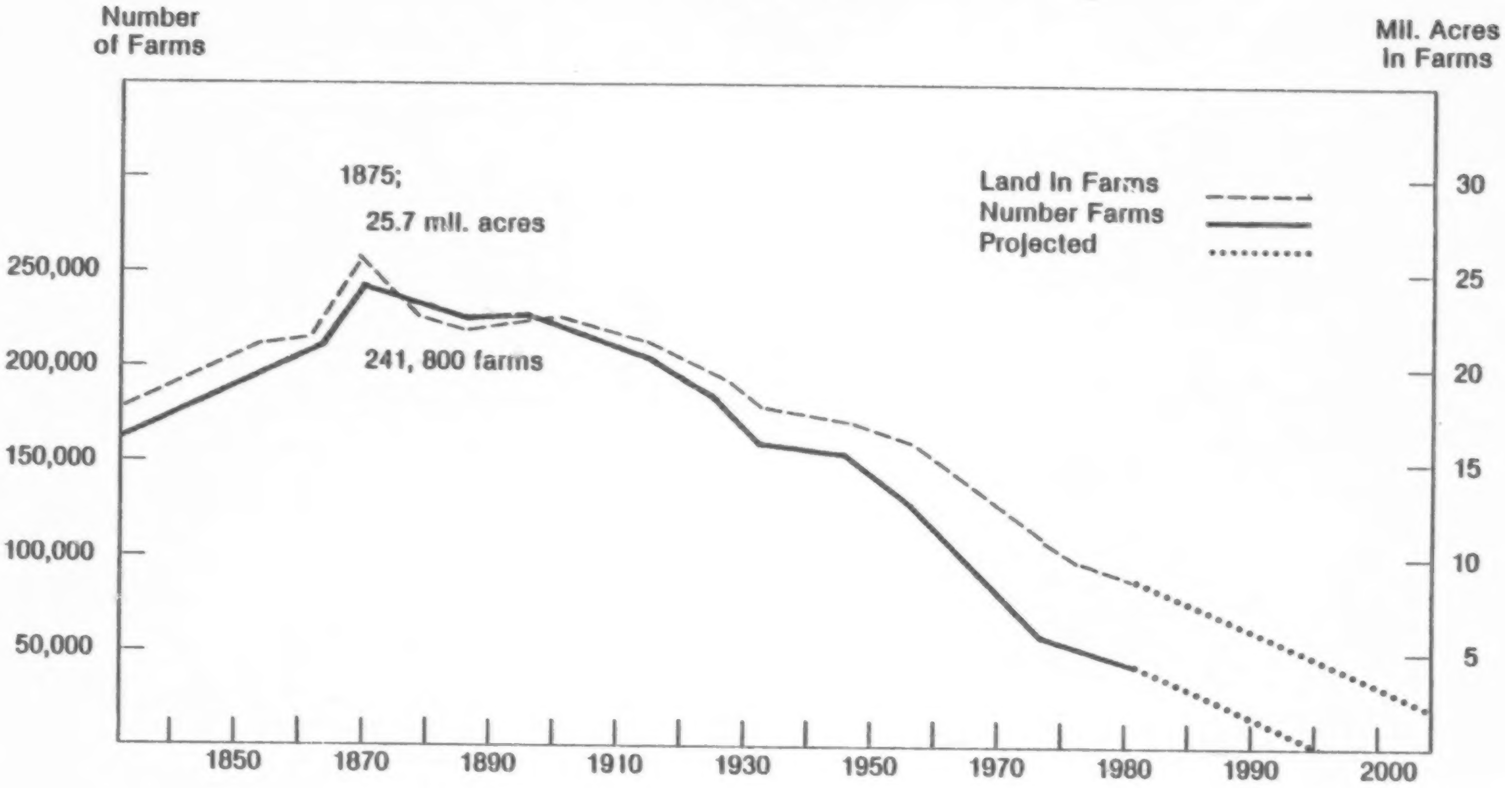
New York State leads the nation in the production of cream cheese, creamed cottage cheese, and cabbage for sauerkraut. Other major products include grapes, sweet corn, beets, Italian cheese, maple syrup, cauliflower, and snap beans.[5]

Despite this productivity, New York's food system is in serious trouble. More than 75 percent of the state's food must be imported,[6] much of it from the other end of the country. Thirty million dollars leave our state each day to pay for the food we import. Meanwhile, New York's own productive potential is being undermined by soil erosion and farmland development. These twin problems result in the loss of 96,000 acres of agricultural land each year,[7,8] an area equivalent to Queens and the Bronx together.[2] Water contamination and air pollution threaten remaining farms. Major changes are needed now to prevent any disruptions of New York's food supply.

Chart #1

NEW YORK STATE, NUMBER OF FARMS AND LAND IN FARMS

1850 to 1980



Adapted from Farm Income Data, New York and United States, C.A. Bratton and Myrtle Voorhels, New York State College of Agriculture and Life Sciences, Cornell University, Ithaca, N.Y., 1978.

What's the trouble?

In 1880, New York State had almost 242,000 farms and more than 25 million acres under cultivation. Today we have some 49,000 farms on about 9.9 million acres,[9] 6 million of which are cropland. In the last two decades, the number of farms has decreased by 28 percent and the land in farms by 19.5 percent.[9]

The figures show that New York is losing farms faster than farmland (see chart 1), reflecting the movement toward larger, more highly mechanized farms. Farms are lost for a variety of reasons, but the primary causes are urban and suburban sprawl and financial difficulties. Farming has become less profitable during the past decade. Despite increases in cash receipts from marketing raw agricultural products, and gains in average gross farm incomes, soaring production expenses have resulted in a reduction of realized net farm incomes.[10] If these trends continue, New York will have few farms by the turn of the century.

Our state's soil is also being lost. Erosion displaces about 45 million tons of New York's topsoil annually,[10] enough to cover all of New York City with nearly 1 1/2 inches of dirt.[2,11] If this rate continues, the productive capacity of over 300,000 acres of land will be gone by the year 2000.[8,12] In addition, much of this soil ends up in lakes and rivers, where it contributes to sediment problems and where the chemical pesticides and fertilizers in it cause pollution.

Since each acre-foot of eroded soil contains about 8000 pounds of nitrogen and 2000 pounds of phosphorus,[13] New York loses about 187 million pounds of nitrogen and 46.9 million pounds of phosphorus each year. This represents some 18 percent of its total fertilizer consumption, and means an annual loss of nearly $20 million in just these two nutrients.[14] In addition, millions of gallons of water storage capacity are lost with this eroded soil.

Conversion of land to nonagricultural uses is another problem. At current rates, New York loses 81,000 acres each year,[7] an area almost the size of Brooklyn, Manhattan, and the Bronx. One-third of this land is prime farmland.[7] Since each square mile of prime land can feed about 10,000 people, over the next 20 years this loss will represent the destruction of a food production base for about 9 million people.[15] Together, erosion and conversion of farmland will result in the loss of 1.5 million acres of cropland by the year 2000, a 25 percent decline in our productive capacity.[8]

Meanwhile, New York imports more than 75 percent of its food. In 1980, our primary unloading points received more than four billion pounds of out-of-state fresh fruits and vegetables,[16] including 84 percent of our lettuce, 77 percent of our celery, 31 percent of our potatoes, 87 percent of our green peppers, 93 percent of our peaches, 74 percent of our strawberries and 21 percent of our pears. In addition, we imported 91 percent of our beef, 95 percent of our pork, 92 percent of our lamb and mutton, 97 percent of our chicken and 64 percent of our eggs. Much of this food came from such faraway places as California, Florida, the Pacific Northwest, and Central America.

California is the main source of most of New York State's imported fruits and vegetables, and unfortunately, one of the most distant. The cost of shipping one truckload of vegetables from California's Imperial Valley to New York City in February, 1981, averaged $2400.[18] The New York consumer is paying between six and fifteen cents per pound just for vegetable transportation. New Yorkers spend $18 billion annually on food, about $1000 per person, and $742 million of that is paid just to bring food into the state.

During the Northeast's growing season in 1978, some 7900 truckloads of imported vegetables (all of which could have been produced locally) came rolling into New York City, using six million gallons (140,000 barrels) of diesel fuel for the 3000 mile trip. If the 55 million heads of iceberg lettuce we ate that season had been produced within 200 miles of New York City, the savings would have been almost 130,000 barrels of fuel and 14 cents per head.[19]

Additional energy is wasted in both transportation and farming. Most of the food distributed in New York State is hauled by trucks, which use more than three times as much energy per ton mile as railroads.[20] And small-scale farming uses substantially less fossil fuel than large-scale farming. On large California farms, the equivalent of one gallon of crude oil in fuel and electrical energy is needed to grow 96 heads of lettuce (4 crates). To simply grow the lettuce that our state imported from California between May and October of 1978, 560,000 gallons of crude oil were needed. Between one-third and one-half of this oil could have been saved with small-scale New York production.[19]

Our food supply is also affected by water supply. Most of California's agricultural land is in the southern two-thirds of the state, which receives only 25 percent of the rainfall. An intricate system of reservoirs and transportation and conveyance facilities channels trillions of gallons of water to this land. The rising energy costs of moving tremendous amounts of water, along with possible decreased availability, will seriously threaten California's future agricultural output.[21]

How did this happen?

How did New York State come to import so much of its food? One hundred years ago, most of the food supply of the Northeast was produced on local farms.[22] There was little large-scale transportation of foods as we know it today. At one time New York was known as the "Granary of the Revolution," because of its extensive wheat production.

But after 1850, grain from the newly-opened Midwestern wheat lands began to flood Eastern markets. New York farmers began to lose their competitive advantage in local markets. They turned first to raising beef cattle and later to producing dairy products, fruits and vegetables.[23] As fertile areas in distant parts of the country developed, along with the transportation system, New Yorkers came to be more dependent upon other regions for their food. The concept of a national agriculture, as opposed to a regional one, was born.

What does food dependence mean?

While the national system is an advantage in terms of year-round availability of certain food items, it has had some major disadvantages for New York. Heavy dependence on imported food means that: 1) our supply is vulnerable to disruption; 2) our system wastes huge amounts of energy; 3) we pay more for less tasty, less nutritious food; and 4) our local economy is weakened.

Vulnerability. Approximately 9,000 truckloads of food come into New York every week to keep us supplied.[24] Any break in the tenuous chain which links New York to its food suppliers could cause widespread shortages. This break could come from a drought or labor strike in California, a transportation strike, or an energy shortage. A quarantine of California produce (which nearly occurred in July, 1981 because of a Mediterranean fruit fly infestation) would severely cut the availability of fresh foods, especially in New York City, as well as increase costs.

One large New York City supermarket estimated that if all deliveries stopped, for whatever reason, their supply of canned goods would last only four days, and perishables only two days.[25] In a city with a population of over seven million, empty supermarket shelves could certainly induce panic, and hunger for many would soon follow. In upstate areas, reserves would last longer, but even there we would soon run out of food.

Energy waste. According to 1980 USDA figures, 5.3 percent of farm food expenditures goes to transportation costs.[26] That figure would certainly be higher for the Northeast. So New York State consumers pay a minimum of $742 million a year to have their food brought into the state. Next time you bite into some California iceberg lettuce, remember that for each calorie of food energy you consume, 36 calories of energy were expended just to bring the lettuce to you.[27]

Much of the food we import, especially vegetables and fruits, could be produced locally, resulting in a drastic reduction in fuel usage. In addition, since local producers would likely be farming on a smaller scale, energy would also be saved in the production of the food.

Cost and taste. Last year, New Yorkers spent about $2 million every day for transportation of imported food. The bad news, of course, is that transportation costs are not likely to decrease or even stabilize. In just nine months (from September, 1980, to June, 1981), trucking rates for vegetables shipped from the Salinas-Watsonville District of California to New York City rose from approximately $2800 per truckload to $3250 per truckload, a 16 percent jump.[28]

As for taste, anyone who has eaten a hard, pink California tomato in February knows that it can't compare to a red, juicy New York State tomato harvested in August. Nutritional quality may be reduced in some transported food since nutrient content is not at its maximum when fruits and vegetables are picked unripe, and the travel time results in some vitamin destruction.

For example, vine-ripened tomatoes have 25 to 30 percent more vitamin C than those picked green and ripened by ethylene gas on the way to market.[29]

Weak economy. Of the $18 billion New Yorkers spent on food in 1979, $14 billion paid for imported food. Since only 20 percent of this money stayed in the state, our food system drained $11.2 billion from the local economy. New York's food exports were valued at approximately $2.1 billion, making quite an imbalance of payments.

Importing such volumes of food depresses our economy in terms of both dollars and jobs. Increasing local food production would not only create jobs, it would enhance the economy considerably. Estimates are that for each dollar increase in income to farmers in the livestock sector, with no further processing of products, there is an additional economic activity value of $2.50. For vegetable farmers, the factor would be $1.60.[30]

What can we do?

Even though the facts are depressing, the situation is not hopeless. There are many things we can do to reverse the seemingly disastrous trend we are observing. New York State could greatly increase its food production.

Looking at the total picture, we have 6 million acres of cropland, 2.3 million acres of pastureland, and 1.7 million acres of land that could be converted to agricultural use.[7] Making adjustments for pastureland which can be converted to cropland, we have 9.25 million acres available or potentially available for growing food.

For New York State to produce all the food it consumes, except beef, pork, and wine, would require 6.8 million acres of land.[6] Just raising all the beef we consume would require over 13 million acres,[31] almost 50 percent more than the existing and potential land available.

From these facts, it is obvious that New York State, on the present diet, cannot be totally self-sufficient in food. In addition to lacking the land to produce our meat, we have neither the soil nor the climate to grow the bananas, citrus fruit, rice, peanuts, coffee, tea and cocoa which we consume. But full self-sufficiency is not necessarily a desirable goal. What we can do is move toward increased self-reliance in food, and in the process reduce food costs, strengthen our economy, and decrease the vulnerability of our supply.

A good place to begin is with vegetables. We currently import about 80 percent of all the vegetables we consume, fresh and processed. To grow all our vegetables would require only 326,451 acres of land, roughly double the 156,626 acres that were harvested for sale in 1978.[9]

According to a 1977 National Agricultural Lands Study, New York has 1.7 million acres which have a high or medium potential for conversion to cropland. Considering just the 400,000 acres with a high potencial for conversion (meaning that similar land has been converted to cropland during the last three years), New York State has enough land that is presently unused to make it self-sufficient in vegetable production.[7,32]

Most of the vegetables we eat could be grown in New York State, but obviously not on a year-round basis. Being vegetable self-sufficient would require minor changes in diet, such as foregoing fresh tomatoes, celery, broccoli and lettuce in winter and substituting cabbage, carrots, potatoes, onions, beets, winter squash, and turnips. (See Chart 2.) These cold-storage vegetables alone could sustain us through the winter, without any additional canned or frozen vegetables. Greenhouses, indoor gardening, and sprouting, as well as canning, freezing, and drying of home garden products could supply substantial quantities of food for winter use. Some crops such as Chinese

Chart #2[33]

VEGETABLES FOR STORAGE

Beets. Pick mature vegetables before first killing frost. Pack in layers of damp sawdust or sand. Requirements: 32 to 40°F., 90 to 95 percent humidity. Life: 4 to 6 months.

Brussels sprouts. Harvest after a few mild frosts. Store in perforated plastic bags. Requirements: 32 to 40° F., 90 to 95 percent humidity. Life: 3 to 5 weeks.

Cabbage. Pick firm, solid heads, and trim off loose outer leaves. Place heads on shelves, string them up by the roots, or wrap in newspaper and store in boxes or bins. (Beware: cabbage emits a strong odor during storage.) Requirements: 32 to 40°F., 80 to 90 percent humidity. Life: 2 to 4 months.

Cabbage, Chinese. Store only mature, solid heads, picked before a severe frost. Store as with regular cabbage, or pack roots in damp soil or sand. Requirements: 32 to 40°F., 90 to 95 percent humidity. Life: 2 to 4 months.

Carrots. Dig before any hard freezes. Store in cartons of sawdust, sand, or leaves. Requirements: 32 to 40°F., 90 to 95 percent humidity. Life: 6 to 8 months.

Celery. Store in trenches in the garden, or place roots in boxes of sand or soil. Requirements: 32 to 40°F., 90 to 95 percent humidity. Life: 1 to 2 months.

Endive, escarole. Pick after moderate fall frosts. Store with roots in soil or sand. Requirements: 32 to 40°F., 80 to 90 percent humidity. Life: 2 to 3 months.

Garlic. After curing, store in paper bags, or braid into strings and hang from rafters. Requirements: 35 to 40°F., 60 to 70 percent humidity. Life: 6 to 8 months.

Horseradish. Dig anytime in fall. Store in damp sand or sawdust. Requirements: 32 to 40°F., 90 to 95 percent humidity. Life: 4 to 6 months.

Jerusalem artichokes. Mulch in garden or store in plastic bags or damp sand. Requirements: 32 to 40°F., 90 to 95 percent humidity. Life: 1 to 2 months.

Kohlrabi. Remove leaves and roots. Store in damp sand or sawdust. Requirements: 32 to 40°F., 90 to 95 percent humidity. Life: 2 to 3 months.

Onions. After curing, remove tops and store in bins or string bags, or braid and hang from rafters. Requirements: 35 to 40°F., 60 to 70 percent humidity. Life: 4 to 6 months.

Parsnips. Mulch in ground or store in damp sawdust, sand, or leaves. Requirements: 32 to 40°F., 90 to 95 percent humidity. Life: 4 to 6 months.

Potatoes, sweet. After curing, wrap individually in newspaper and pack in baskets, or pack loosely (make sure potatoes aren't touching) in cartons of sawdust. Requirements: 50 to 60°F., 60 to 70 percent humidity. Life: 3 to 5 months.

Potatoes, white. Late potatoes store best. After curing, pack in baskets or boxes. Don't store near apples, which give off a gas that promotes sprouting. Requirements: 32 to 40°F., 80 to 90 percent humidity. Life: 4 to 6 months.

Pumpkins. After curing, place on shelves or in boxes. Requirements: 50 to 60°F., 60 to 70 percent humidity. Life: 4 to 6 months.

Rutabagas. Dig after a few mild frosts. Store in damp sand, sawdust, or moss. Requirements: 32 to 40°F., 90 to 95 percent humidity. Life: 2 to 4 months.

Salsify. Mulch in garden, or store like parsnips. Requirements: 32 to 40°F., 90 to 95 percent humidity. Life: 1 to 2 months.

Squash, winter. After curing, pack on shelves or in boxes. Requirements: 50 to 60°F., 60 to 70 percent humidity. Life: 4 to 6 months.

Tomatoes, green. Pick mature green fruits before frost. They will gradually ripen at 55 to 70°F. Requirements: 50 to 60°F., 60 to 70 percent humidity. Life: 4 to 6 weeks.

Turnips. Harvest before a heavy freeze. Store like carrots. Requirements: 32 to 40°F., 90 to 95 percent humidity. Life: 2 to 4 months.

brassicas, kale, parsnips, and Jerusalem artichokes can be harvested throughout much of the winter.

Currently, New York is self-sufficient in foods such as cabbage, sweet corn, beets, veal, fluid milk, cottage cheese, and onions. But we don't always consume what we produce. Take an interesting example: cauliflower. New York State produces more of this vegetable than it annually consumes. In 1979, we produced over 34 million pounds of cauliflower and consumed 32.2 million pounds. Yet we imported over 8 million pounds, mostly from California.

Cauliflower is imported from California because it is available there for 11 months of the year (March excluded), whereas upstate and Long Island cauliflower is available only five months of the year, primarily in the fall.[17] Since cauliflower is not a storage crop, consumer demand for fresh cauliflower in winter must be met by importation from the West and South. Conversely, when our crop is harvested we export some and process some, presumably because it cannot all be consumed locally during the harvest season. Most of the cauliflower shipped out of New York is from Long Island, and is exported to such cities as Baltimore, Boston, Philadelphia, Pittsburgh, and Providence.[16]

An increase in New York State production of cauliflower for freezing would be one way to decrease our importation. New Yorkers already consume nearly 30 percent of their cauliflower in frozen form. Or consumers could eat this vegetable only when local cauliflower was available, as was done until relatively recent times.

Another option for increasing self-reliance would be to decrease meat consumption. If we cut our beef consumption by 80 percent and our pork consumption by 50 percent, and made up the difference with slightly increased consumption of fish, poultry, dairy products, grains, and beans, we would have no problem meeting our protein requirements. With such a diet, it would take a total of 10.2 million acres to produce all our food -- something close to the 9.25 million acres of farmland and potential farmland we have. This will certainly not happen, and we are not suggesting it should, but it gives an idea of the possibilities for change.

There is already a trend in that direction. A 1979 USDA survey found that 15 to 20 percent of the households interviewed had reduced their use of bacon or sausage, hot dogs or luncheon meats, eggs, beef, and fresh pork and increased their use of poultry and fish during the past three years. Twenty-five percent had increased their use of fruits and vegetables. Concern about fat, cholesterol, salt and sugar intake were reasons cited for these diet changes.[34]

Perhaps the most important thing needed to stimulate regional agriculture is the assurance of markets for farm products. Currently, New York has more than 1000 permanent roadside farm stands, over 600 "pick-your-own" farms, 90 farmers' markets and over 50 direct-sale vineyards and wineries.[35] Over 10,000 NYS farmers (about 23 percent of the total) sold some product directly to consumers in 1979, vegetables being the most widely marketed.[36] But more direct market outlets are needed.

The benefits of direct marketing include increased income for the farmer, fresher, tastier, and cheaper food for the consumer, and a stronger link between producer and consumer. Farmers marketing their products in New York City in 1979, reported getting from 25 to 100 percent above the average wholesale price while consumers averaged savings from 7 to 35 percent. Direct marketing also allows producers to respond directly to consumer demand, as attested to by farmers participating in New York City's Greenmarket, a nonprofit direct marketing program which runs 16 outdoor markets. Prior to joining the Greenmarket, farmers were growing from 3 to 15 types of vegetables. By 1979, from 12 to 50 types were being grown. Included in this diversification were collards, kohlrabi, chinese cabbage, snow peas, dandelion greens, parsnips, and shallots.[37]

Food manufacturing plants should also be an important market for New York State products. The more raw agricultural products produced in the state that are used in local manufacturing, the greater the economic impact. A cheesemaker who uses only New York State milk will generate more economic activity in the state than a bakery which relies on out-of-state flour.[30]

Growing more of our own food in gardens is another way to expand regional self-reliance. Forty-three percent of U.S. households had gardens in 1980, producing an average of 588 pounds of food. Based on this data, and excluding the New York City population, the state has 1.3 million gardens[2,38] which produce 764.4 million pounds of food, over 25 percent of the fresh vegetables we now eat. If all New York State households outside New York City grew 588 pounds of vegetables, they could produce about 65 percent of our fresh vegetables.

This is unlikely to happen, of course, but the potential for expanded garden production is great. Since the proportion of gardening households increases as food prices rise, the upsurge in home gardening will undoubtedly continue. Urban gardening, whether in community lots, patio containers, windowboxes, rooftops or backyards, can also produce an abundance of food. In New York City, under the Cornell University Cooperative Extension Urban Gardening Program, there are about 3500 city gardens, one-third of which are 100 square feet or less in size. Last spring and summer they produced 485,000 pounds of food with a total retail value of over $520,000.[39]

In addition to producing more of what we consume, we could strengthen our food system by increasing local fertilizer production. In 1979, New York State used 659,250 tons of fertilizer,[14] most of it brought in from outside the state. If we made use of all the nitrogen, phosphorus and potassium nutrients available in livestock, poultry and human wastes, we could produce 61 percent of the nitrogen consumed, 27 percent of the phosphorus and 82 percent of the potassium,[40] and make substantial cutbacks in our fertilizer imports.

Recommendations for Change

Given the vulnerability of our existing food supply, it is clearly desirable for New York to develop a more sustainable agricultural base, and to increase and diversify local food production. There are many different ways to achieve these goals. In this report, it is not feasible to describe all our possible options, so we will focus on three: 1) an overall state food plan that addresses eight areas of concern, 2) an emergency state plan for feeding New Yorkers, 3) actions which New York State consumers can take to better control their own food supply.

1. State Plan for New York's Food System

A. Preservation of Farmland

Remaining farmland must be protected from non-agricultural use. The USDA Soil Conservation Service (SCS) has mapped out New York's important farmlands, showing locations of prime farmland and indicating where urban and suburban sprawl might encroach on productive farmlands in the future. The SCS is preparing county maps of a similar nature. These maps should be used by community leaders and state planners to protect certain areas from development and speculation, perhaps through tax incentives, inheritance tax laws, and community action.

One way New York is acting to preserve farmland is through its agricultural districts law, the oldest in the nation, which was passed in 1971. Farmland which is part of an agricultural district is protected from urban expansion and may receive a use value tax assessment, which allows the farm to be taxed at its farm production value rather than its potential market value. This measure especially benefits farmers located in suburban counties. As of July, 1981, over 7 million acres of farmland had been set aside in 434 agricultural districts.[41]

In Suffolk County, a county plan to purchase development rights may save about 43 percent of some 68,000 acres of farmland from development. Under the plan, a farmer who sells his development rights is paid the difference between the value of his acreage for development and its value for agriculture, thus keeping the land available for crops. Residents of Southampton, in Suffolk County, recently voted to raise taxes for farmland preservation.[42] Other counties threatened by urban and suburban encroachment might follow this lead. A proposed statewide Transfer of Development Rights (TDR) program has been viewed as too complicated to administer and the state legislature has not acted on it in recent years.

Other farmland preservation options include tax breaks for farmers who voluntarily restrict development of their prime agricultural lands, state-imposed agricultural zoning, easing of inheritance taxes, establishment of a development permit system, institution of capital gains tax on land sales and speculation, establishment of a heavy tax on profits made on the development of previously agricultural land, and creation of "agricultural open space preserves," which require each municipality to designate an agricultural preserve within its boundaries composed of at least 70 percent of its prime farmland. Another strategy, in operation in France, grants the state "first refusal" rights to agricultural land being sold.

Finally, legislation is needed to prevent "leapfrog" or random development, which results from poor planning. As urbanization creeps out towards farms, and tax rates rise, farmers often bear a disproportionate share of the new tax burden, and thus end up subsidizing the loss of farmland!

Some steps are being taken to help farmers. The New York State legislature has passed two important bills, one permits apple grower-processor discussion settlements on prices and terms, and the other is "right-to-farm" legislation which protects agricultural practices that might violate the state nuisance law.[43]

B. Soil Conservation

New York State has had a conservation law since 1975, requiring a conservation plan for all agricultural lands in excess of 25 acres. About one-third of our farms now have a plan, with the remaining plans to be completed by 1987.[44] Some additional possibilities for soil protection include incentive packages at state and federal levels to encourage good conservation and land management principles, a tax on each ton of soil lost from agricultural land, the prohibition of all agricultural production activities which result in more than five tons of soil loss per acre per year, the linking of state purchase of farm commodities to soil conservation programs, and increased public awareness of the need to support sound soil conservation practices. Specific tax incentives could be implemented for conservation techniques such as contour tillage, strip cropping, crop rotation, cover crops, and minimum tillage.

C. Production

Greater emphasis needs to be placed on diversity in farm crops and livestock production if we are to stimulate regional agriculture. Demonstration farms, which experiment with new varieties, with varieties suited to particular climates and soils, and with improved or alternative farming techniques should be developed with support from the USDA, the State Department of Agriculture and Markets, and Cornell University. Policies could be adopted which encourage people to enter farming and provide on-farm specialized training.

The Massachusetts-based New England Small Farmer Project offers assistance to small farmers in various ways, from helping with credit applications to organizing. In Wayland, New York, one of the activities of Project REACH involves helping small-scale producers, primarily in Steuben County. More programs of this nature need to be established throughout the state. Technical assistance regarding diversification should be made available to farmers to help assure success with any changes being made. Increased production by farmers who must depend on off-farm income could help revive regional agriculture, as well as increase the number of full-time farmers. Research is needed to determine what commodities can be produced which will compete favorably with imported products. Home gardens, greenhouses, and use of urban land for food production should also be encouraged.

D. Marketing

New York State already has a strong direct marketing program, which promotes the purchase of locally-grown products by consumers, and more recently, by institutions, agencies, wholesalers and retail stores. A plan to encourage supermarkets to purchase and sell regionally-produced food must be a priority if local foods are to compete with imports. Education is a key here:

supermarket buyers and consumers alike need to learn that purchasing local products helps the economy and decreases the vulnerability of our food supply.

Farmers' markets, roadside stands and "pick-your-own" outlets are becoming more and more popular with consumers, who are recognizing the benefits of fresh, local farm food. Increasing the number of farm stands on the New York State Thruway and selling farm products at large factories and plants would also increase markets. However, direct marketing to consumers must be combined with marketing to retail stores; institutions such as schools, universities, prisons, senior-citizen centers, day-care centers, and hospitals; and wholesalers.

Consumer cooperatives, restaurants and food processors must also get the message to buy more local products. Establishing food processing and storage facilities to supply and distribute products on a year-round basis would help create outlets for items other than fresh produce at harvest time. These centers could grade, pack and distribute the output of small local producers and provide large buyers with the volumes and specifications they demand.[45] Adequate quality control must be guaranteed if local foods are to compete with imports.

Some small farmers in northern New York State have organized themselves into a producers' cooperative to distribute a wide variety of locally-grown foods. The Natural Farmers Cooperative of the St. Lawrence Valley offers technical assistance to inexperienced growers, purchases supplies and services in bulk and markets its own products, thereby eliminating profits to private middlemen and offering lower prices and higher quality food to buyers. These efforts should be encouraged and expanded.

The New York State Assembly and Senate recently passed an amendment to the Agriculture and Markets Law which would develop institutional direct marketing programs, encourage direct marketing to public and private state agencies, and assist wholesale buyers and retail food stores seeking to purchase farm and food products directly from farmers. This legislation should help local producers.

Other options include electronic markets which centralize price negotiation, thus allowing for direct marketing but including the advantages of pricing accuracy normally associated with larger markets, and a forward deliverable contract market which could achieve the benefits of open market trading along with the benefits of contracting. Exclusive agency bargaining, vertical integration through ownership, joint ventures between agricultural cooperatives and agribusiness marketing firms, marketing orders and marketing boards are also potentially viable strategies.[46] Several forms of tax incentives might work in New York, including exemption of the first $10,000 worth of food produced for local consumption and tax incentives to attract food processors to the state who wish to reduce transportation costs by locating near a major distribution center. Other possibilities include assistance to small growers through a state-wide marketing clearinghouse, and the expansion of on-farm processing, cooling, and fresh packing of local food crops.

E. Energy

Increasing regional food production with small farms would reduce the amount of energy needed to transport food, irrigate Western lands, and might decrease the energy consumed by large farm machinery. Further energy conservation could also be practiced in local areas. One New York dairy farm is the site of a new research project being conducted by Cornell University, the U.S. Department of Energy, and the New York State Energy Research and Development Authority, in which as much as 65 to 75 percent of the energy required to run the farm will be generated by producing methane gas from manure and a liquid fuel from corn or sunflower seed. The methane will run a generator which produces electricity. Waste heat from the generator will be recycled to heat water for the "digester," which treats the manure. The manure will still be available for fertilizer, since none of its nutrient value is lost in the process.[47] The success of this project may have a significant impact on energy conservation in the agricultural sector of our state.

Another energy-saving technique for New York dairy farms would be to feed less grain and more forage (hay, silage, pasture and crop residues) to dairy cows, since grain requires 65 to 70 percent more energy per kilogram of protein produced. In order to do this, some land must be returned to productivity and forage quality must be improved to guarantee adequate milk yields.[48]

Other options in energy conservation include developing incentives and methods for the conversion of local organic wastes to fertilizer, establishing an Agricultural Waste Council in the New York State Department of Agriculture and Markets to develop desirable legislation and other measures to facilitate the recycling of these organic wastes, providing investment credits for construction of structures such as energy-saving barns and greenhouses, developing incentives for water conservation measures, and initiating educational programs for reduced pesticide use. Encouraging use of water or wind energy for generating power is another possibility.

Too, consumers should be made aware of the energy used in food production and preparation. If the nation's population were to substitute wheat flour as a source for half of the 36 trillion calories it consumes as refined sugar, the annual energy saving would be the equivalent of almost 13 million barrels of oil.[49] There is generally an overconsumption of food in the U.S. today, so cutting down on sugar and calories in general would help, as would decreasing the waste in home food preparation and consumption. In terms of food preparation, baking is more energy-intensive than stove-top cooking; pressure cookers are excellent energy savers.

F. Rural Life

Preserving and strengthening the family farm should be a top priority. A recent task force recommended that the state Extension Service and the experiment stations channel more effort into helping small- and moderate-sized farms, in part by doing research into farm size and maximum efficiency.[50] Beginning farmers could be offered guaranteed state loans with deferred or reduced payments until five years after start-up, a program currently being followed in Minnesota. Young people interested in learning about farming could take part in organized on-farm summer work activities. Another possibility would be to develop "entry packages" for new farmers that would include help in obtaining the needed quantities of land, capital, and advice, together with managerial and organizational assistance.

An interesting trend which needs attention is the "rural revolution." New York's rural population is increasing at a significant rate; today our state has the third largest rural population in the nation. However, most of these residents are not farmers, and statistics show that non-agricultural people living in rural areas outnumber farmers by a ratio of 20 to 1. This situation can create economic pressures affecting the ability of farmers to operate a farm profitably.[10] Rural needs and affairs, in general, need to be given a higher priority in the federal and state governments, the USDA, and state universities.

G. Research

One option in this area might be appropriating additional funds (or channeling existing funds) to New York's land grant university for research on sustainable farming methods and local food production. Joint research projects with the Department of Agriculture and Markets are another possibility.

H. Government

For several years now, New York has been developing a state food policy which will be ready to go to the state legislature in the near future. Among the goals of the policy are to 1) maintain the resource base of New York State, including farms and farmland, 2) determine which imported foods can be produced locally, 3) expand export markets for New York State-produced foods, 4) assure development of fisheries and aquaculture, 5) develop a clearinghouse for food-related research going on in the state, 6) encourage the identification and promotion of New York food products by producers, wholesalers and retailers, 7) promote nutrition education, and 8) encourage local responsibility for the food supply through community planning, self-reliance programs, and regional interdependence. A state food policy could help increase our self-reliance and economic viability while decreasing the vulnerability of our food supply.

2. Emergency State Food Plan

An emergency state food plan for New York State needs to incorporate measures which will deal with contingencies such as: 1) a complete oil cut-off to the U.S.; 2) a multi-year drought or insect infestation in our food producing areas or areas which supply us; 3) a near shutdown for one to four weeks of the U.S. trucking and rail system; 4) a widespread labor dispute which could cut off the flow of food into New York; and 5) an extraordinary leap in food prices so that only the wealthiest people could afford to buy food.

Some options New York has for dealing with these contingencies include the establishment of state or regional grain storage facilities, the encouragement of home, community and city storage of basic foodstuffs, the formation within our current Civil Defense organization of state-wide communication and coordination centers for dealing with a food emergency, and the general encouragement, expressed in all these measures, of producing more of our food within New York State.

3. New York State Consumer Activities

There are a wide variety of options available that will help the New York consumer deal with the increasing price of food and the vulnerability of our supply. Tax and other incentives could be used to encourage local production of food by expanding home gardens, producing food in the winter with small-scale greenhouses or "growth frames," or in larger greenhouses or "sunspaces" that can be added on to existing houses, producing protein with small-scale fish, rabbit or quail culture, and processing and storing more food at home. Consumers could also buy foodstuffs in large quantities when they are in season and then preserve them, form buying clubs to purchase foods directly from producers, develop more community and urban gardens, and establish community canneries and warehouse facilities.

Implementing the most appropriate of these measures could greatly strengthen New York's food security and economic viability, while providing New Yorkers with more nutritious and better tasting food. Such changes would decrease our vulnerability to situations outside our control and help create a more sustainable food system for New York State. Without changes, the system will crash. However, we can choose to make a "soft landing" and prevent any serious food problems. There are solutions and we still have time to act. If New York is to regain control of its food system, the state must be willing to provide the resources necessary to develop and implement a realistic plan of action. We cannot delay any longer. The time to begin is now.

Notes

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New York State Food Imports

Although New York State is a leading food producer in the Northeast, and agriculture is the state's largest industry, New York's food system is in serious trouble. More than 75 percent of the food must be imported, much of it from the other end of the country. New Yorkers pay over $700 million annually just to bring food into the state.

However, New York State could greatly increase its food production. For example, most of the vegetables New Yorkers eat could be grown in the state, though not on a year-round basis. In addition to producing more of what is consumed, other steps need to be taken, such as preserving farmland, conserving soil and energy, and expanding markets. Implementing appropriate measures could greatly strengthen New York's food security and economic viability.

Footnotes

[a] Retail weights for NY production are taken from 1979 New York Agricultural Statistics or Agricultural Statistics 1980 (USDA) and converted where necessary using USDA conversion figures.

[b] Sources for prices: U.S. Department of Labor, Bureau of Labor Statistics, A & P, Watertown, N.Y. and Daitch Shopwell, New York City.

[c] Direct Marketing By New York Farmers, preliminary report, N.Y. Department of Agriculture and Markets, Crop Reporting Service, March 1981.

[d] Consumption in N.Y. is based on U.S. per capita consumption figures as they appear in Agricultural Statistics 1980 and Food Consumption, Prices and Expenditures, USDA Statistical Bulletin No. 656.

[e] Based on acreage requirements of 90% marginal land, i.e. hillsides and land unsuited for crops. Dr. Lowell Wilson, Penn State University.

[f] 147,250,000 dozen

[g] Data supplied by Dr. Donald Keating from N.Y. Crop Reporting Service State Survey, unpublished.

[h] Fishery Statistics of U.S. 1976. Finfish data excludes freshwater recreational catch, estimates not available.

[i] Division of Dairy Industry Services, N.Y. Dept. of Agriculture and Markets, Mr. David Bucciferro.

[j] New York State Dairy Statistics, 1979 Annual Summary, N.Y. State Dept. of Agriculture and Markets, Division of Dairy Industry Services.

[k] 118,833,000 gal.

[l] 1980 per capita consumption figures, Milk Industry Foundation.

[m] Includes evaporated skim milk.

[n] Includes ice cream, ice milk, sherbets, mixes.

[o] For import and export calculations, total consumption figures (fresh and fresh equivalent weight) are used.

[p] Retail value of amount imported reflects fresh and processed retail values.

[q] Estimate, tomatoes for processing, Dr. Brian How, Cornell University.

[r] Includes cabbage, broccoli, cauliflower and brussels sprouts.

[s] 1978 Census of Agriculture, part 32 New York.

[t] Yield per acre obtained from Kling Farms, Fonda, N.Y.

[u] Based on 1979 yield/acre for N.J.; No N.Y. data available.

[v] Yield per acre obtained from Torrey Farms, Elba, N.Y.

[w] Fresh beets, limas, green peas are included in minor vegetables.

[x] Based on 1979 U.S. average yield/acre; No N.Y. data available.

[y] Per capita consumption figures supplied by American Mushroom Institute.

[z] Estimate supplied by Dr. Wayne Knapp, Cornell University.

[aa] Soya, Grits and flour.

[bb] Estimate based on telephone survey of tofu shops in New York State.

[cc] Based on total U.S. tofu production of 52 million pounds, supplied by Mr. Ira Leviton, Soycrafters Association of North America, Inc.; assumed to be U.S. consumption.

[dd] USDA Livestock and Meat Statistics, supplement 1979.

[ee] Lard is a by-product of hog slaughter.

[ff] Clinton Corn Co., Montezuma, NY; largest corn processor in the state.

[gg] Includes wheat flour and cereal.

[hh] Flour.

[ii] Includes malt and pearled barley.

[jj] 11,987,500 gallons. Conversion factor of 1 ton grapes yielding 175 gallons wine supplied by Wine Institute, San Francisco.

[kk] 315,000 gallons.

[ll] This total acreage figure excludes land needed to grow grapes for wine.

[mm] Total Nuts, exluding peanuts.

[+] Several fresh items include figures for processed, where no further breakdown was available. Consumption data are for fresh.

NA - Not Applicable

NC - Data not collected by USDA, N.Y.Department of Agriculture and Markets or other agencies.

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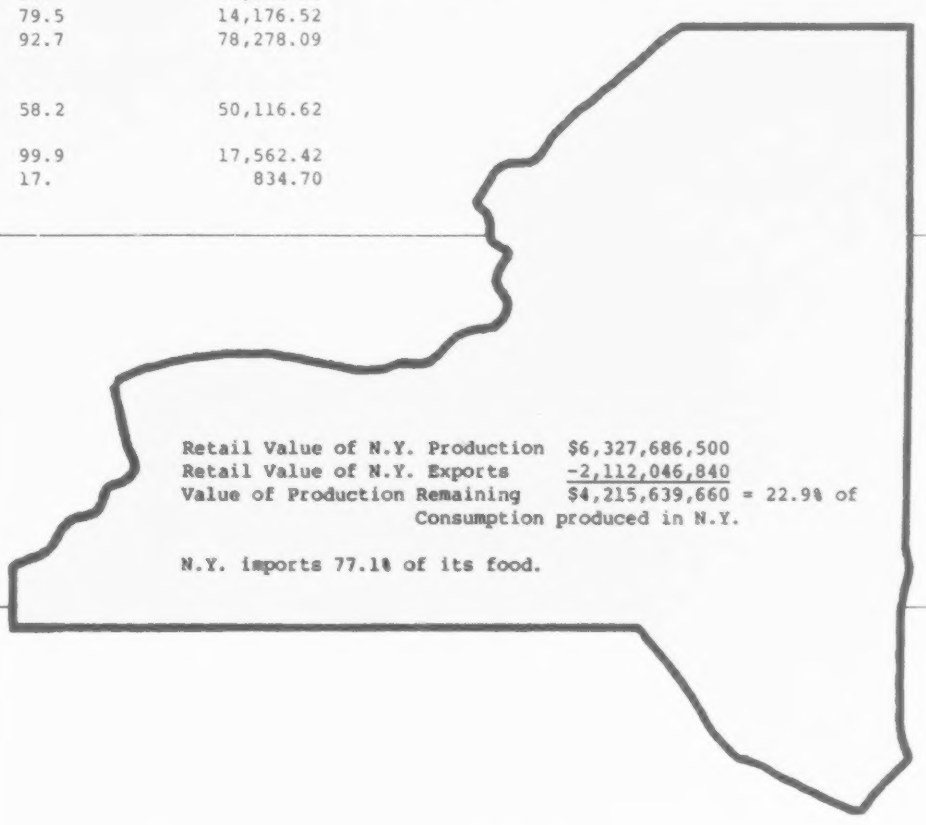
New York State Food Imports

AS DETERMINED BY FOOD PRODUCTION AND CONSUMPTION BY WEIGHT AND RETAIL VALUE

COMMODITY	PRODUCTION (Total Fresh & for Processed)			CONSUMPTION						
	Retail Weight[a] (1,000 lbs)	Retail Value[b] ($1,000) (1980 $)	Direct Market[c] $ Value of Sales (1,000)	Consumption in NY[d] (1,000 lbs.)	Retail Value ($1,000) (1980 $)	% Imported	Retail Value of Amount Imported ($1,000)	Amount Exported (% of Production)	Retail Value of Amount Exported ($1,000)	Amount of Land Required to Produce 100% of NY Consumption (Acres)
Meats										
Beef	120,583.15	284,576.23		1,428,008.	3,327,258.6	91.6	3,027,804.7			13,851,677.[e]
Veal	42,393.6	126,756.86		28,703.7	85,824.06			32.	40,562.19	
Lamb/Mutton	1,832.6	4,489.87		23,321.7	57,138.16	92.1	52,624.24			7,773.9
Pork	50,473.15	68,643.48		1,158,911.	1,576,118.9	95.6	1,506,769.6			1,267,868.
Edible offals	NC			182,985.9						
Poultry										
Chicken	22,712.4	17,034.30		923,899.7	692,924.77	97.5	670,212.29			461,945.
Turkey	3,541.6	3,286.60		181,191.9	168,146.1	98.	164,783.08			148,450.
Eggs	230,691.[f]	128,107.5		642,244.84	349,220.6	64.	223,782.34			386,786.
Duck	20,022.[g]	18,420.24						majority		
Livestock, Poultry & Products			13,336.38							
Fish										
Finfish	5,194.5[h]	12,155.13		177,604.	415,593.36	97.1	403,541.15			
Shellfish	17,633.0[h]	88,165.		53,819.	269,095.	67.3	59,335.04			
Dairy Products[i]			8,025.28							1,976,000.
Cheese	304,480.	739,886.4		315,740.	767,248.2	3.5	26,853.68			
Cottage Cheese	250,538.	263,064.9		82,523.08	86,649.25			67.	176,253.48	
Milk	4,100,000.	1,066,000.		4,258,718.6[l]	1,107,266.6	7.9[i,j]	221,224.9	22.45[j]	623,346.62	
Cream				66,374.3	172,573.					
Sour Cream	71,187.	56,237.73		33,726.82[l]	26,644.19			52.6	37,444.36	
Yogurt	102,068.	112,274.8		47,899.26[l]	52,689.19			53.	59,505.64	
Eggnog	7,930.			7,714.11[l]				2.7		
Condensed Skim Milk	84,797.	55,118.05		60,995.32[m]	39,646.95			28.	15,433.10	
Condensed Whole	44,377.	54,583.71		19,733.78	24,272.55			55.5	30,021.04	
Nonfat Dry Milk	42,152.	57,748.24		60,995.32	83,563.18	30.8	25,737.58			
Dry Whey	38,323.	28,742.25		55,613.38	41,709.75	31.	12,929.79			
Frozen Desserts[n]	475,332.[k]	527,618.5		482,580.62	535,664.46	1.5	8,034.97			
Butter	35,851.	68,475.41		82,523.1	157,619.12	56.5	89,054.80			
Vegetables, Fresh[+]						--[o]	--[p]	--[o]		
Potatoes	1,289,400.	322,350.	582.94	909,547.86	227,386.97	31.9	215,674.99			31,913.
Onions	409,500.	135,135.		197,337.8	65,121.47			47.8	65,540.47	5,979.
Snap Beans, fresh	23,800.		208.04							
processed	212,500.									
Total	236,300.	186,677.		23,321.74	18,424.17			45.[j]	84,564.68	5,004.6
Cabbage	338,100.	64,239.	1,159,569.[r]	145,312.38	27,609.36			62.5	59,785.87	3,864.7
Sweet Corn, fresh	141,100.		5,833.66							
processed	199,000.									
Total	340,100.	85,025.		121,990.64	30,497.66			22.8	19,385.70	18,767.78
Tomatoes, fresh	39,000.		2,307.17							
processed	6,500.[q]									
Total	45,500.	26,390.		193,749.8	112,374.88	94.	425,615.58			14,903.8
Lettuce	70,200.	26,676.		434,143.16	164,974.4	84.	138,578.49			22,263.7
Cauliflower	34,600.	18,338.		21,527.76	11,409.71			6.67	12,231.45	2,242.39
Carrots, fresh	30,500.									
processed	28,380.									
Total	58,880.	21,198.8		105,844.8	38,104.13	61.	34,393.62			3,675.16
Cucumbers	31,100.	27,679.	422.67	69,965.22	62,269.03	83.16	152,846.16			6,083.9
Celery	28,100.	9,835.		125,578.6	43,952.51	77.6	34,107.14			2,683.3
Green Peas, processed	20,840.	10,420.				72.7				
fresh			37.98	--[w]						--[w]
Squash	80,384.[s,t]	31,349.76	271.95	NC						
Peppers	7,353.5[s,u]	3,529.68	308.45	57,407.36	27,555.53	87.2				10,437.7
Pumpkins	45,450.[s,v]	17,725.50	363.01	NC						
Asparagus	364.[s,x]	505.96	33.54	5,381.94	7,480.89	97.3	10,795.17			2,242.5
Other Vegetables			12,897.38							
Sweet Potatoes	NC			71,759.2	17,939.80					6,239.9
Eggplant	2,218.5[s,u]	1,752.6		10,763.88	8,503.46	79.4	6,751.75			742.
Minor Vegetables[w]				71,759.2	42,337.9					5,881.9
Mushrooms	8,144.	11,320.		48,437.46[y]	67,328.36	83.	55,882.29			
Artichoke	0.			7,175.92	2,798.6	100.				NA
Broccoli	1,410.4[s,x]	705.2		23,321.74	11,660.37	97.	31,336.82			2,844.1
Spinach	6,805.5[s,u]	3,334.69		7,175.92	3,516.20	79.5	14,176.52			1,025.
Garlic	1,170.[s,x]	6,119.10		16,145.82	84,442.39	92.7	78,278.09			1,241.
Southern Greens/Misc.	NC			20,989.57	12,383.84					
Dry Edible Beans	48,000.	36,000.		114,814.72	86,111.04	58.2	50,116.62			95,678.
Dry Field Peas				7,175.92	2,798.61					5,224.
Soybeans	1.56[x]	.76		35,879.6[aa]	17,580.	99.9	17,562.42			22,999.
Tofu	3,418.5[bb]	4,068.		4,126.2[cc]	4,910.2	17.	834.70			1,202.
Vegetables, Frozen										
Broccoli	NC			24,577.53	20,645.13					3,596.7
Carrots	NC			19,554.38	13,883.61					1,127.09
Spinach	NC			13,096.05	7,857.63					1,870.86
Asparagus	NC			1,435.18	3,975.45					717.59
Snap Beans	NC			22,065.95	17,432 [illegible]					6,297.79
Lima Beans	NC			9,149.3	8,874.82					6,633.24
Brussels Sprouts	NC			5,202.5	4,890.35					446.
Cauliflower	NC			8,969.9	8,431.71					1,121.2
Corn	NC			18,477.9	11,086.74					3,411.3
Onions	NC			13,454.85	13,454.85					493.34
Peas	NC			31,215.25	20,602.06					10,098.5
Potatoes	NC			324,710.38	207,814.64					25,293.23
Vegetables, Canned										
Carrots	NC			8,969.9	4,395.25					414.23
Spinach	NC			14,351.84	6,458.33					1,847.28
Asparagus	NC			5,381.94	10,225.69					2,735.82
Snap Beans	NC			107,638.8	52,743.01					16,446.
Lima Beans	NC			7,175.92	7,462.96					2,803.1
Corn	NC			98,668.9	45,387.69					18,215.80
Peas	NC			57,407.36	22,388.87					12,625.02
Whole Tomatoes	NC			104,050.84	56,187.45					12,406.1
Catsup, Paste, Sauce	NC			260,127.1	195,095.32					31,015.15
Tomato Puree	NC			14,351.84	7,749.99					1,711.17
Tomato & Veg. Juices	NC			50,231.44	13,562.49					
Pumpkin/Squash	NC			10,763.88	6,027.77					940.9
Beets	158,200.	83,846.		17,939.8	9,508.09			70.25	58,692.2	731.43
Pickles	NC			154,282.28	121,883.					9,981.46
Sauerkraut	165,360.	31,418.		23,321.74	7,462.96					1,153.06
Potatoes	NC			25,115.72	9,795.13					1,339.5
Sweet Potatoes	NC			19,733.78	11,642.93					2,217.
Potato Chips & Dehy.	NC			102,256.86	231,100.50					
Fruits, Fresh										
Apples	1,035,000.	662,400.	8,825.	297,800.68	190,592.44			71.	470,304.	22,907.7
Peaches	6,700.	2,596.		98,668.9	37,493.84	93.3	34,981.75			20,877.8
Pears	35,400.	24,780.	226.92	44,849.5	31,394.65	21.1	6,592.88			6,529.3
Sweet Cherries	8,100.	7,209.	120.05	10,763.88	9,579.78	24.7	2,366.21			3,443.3
Tart Cherries	27,300.	13,377.								
Strawberries	8,400.	7,728.	2,452.	32,291.64	29,708.31	74.	21,984.14			6,941.45
Grapes	6,000.	7,740.	58.39	55,613.38	71,741.26			83.	353,331.	6,768.
Melons	7,637.[s]	3,207.54	179.85	147,106.36	61,784.67	94.8	58,571.87			9,552.36
Plums, Prunes	5,406.08[s]	4,216.74	110.85	30,497.66	23,788.17	82.3	19,577.66			7,030.35
Watermelon	707.6[s]	134.44		202,719.74	38,516.74	99.6	38,361.94			17,475.
Bananas	0.			383,911.72	134,369.1	100.	134,369.1			NA
Citrus	0.			430,555.2	215,277.6	100.	215,277.6			NA
Other Fruits & Nuts			540.16							
Nuts										
Walnuts	2.7[s]	9.61		30,497.66[mm]	158,587.83	99.95	158,429.21			308,368.6[mm]
Other	13.3[s]	90.97								
Peanuts	0.			127,372.58	371,927.93	100.	371,927.93			NA
Fats & Oils										
Lard	4,193.15[dd]	2,893.27		46,643.48	32,184.0	91.	29,287.44			--[ee]
Margarine	NC			206,307.7	179,487.69					
Shortening	NC			339,062.22	254,296.65					
Oils	15,600.[ff] (corn)	14,664.		414,409.38	389,544.48	96.	373,962.70			
Grains										
Wheat (flour)	270,956.	73,158.12		2,204,801.4[gg]	595,296.37	88.	368,642.78			2,338,071.
Rye	Insignificant			14,351.84[hh]	3,874.99	100.	3,874.99			8,008.8
Oats	Insignificant			57,407.36	34,444.42	100.	34,444.42			28,935.2
Barley	Insignificant			21,527.76[ii]	10,548.6	100.	10,548.60			9,343.6
Buckwheat (groats)	3,189.	4,113.81								
Rice	0.			165,046.16	117,182.77	100.	117,182.77			NA
Corn Meal, Flour, Cereal, Starch	Insignificant			213,483.62	172,921.73					50,231.
Corn Sweeteners	438,000.	262,800.		685,300.36	411,180.21	36.	148,024.87			179,163.
Processed Fruit Products			782.08							
Dried Fruits	NC			55,433.98	88,140.03					
Frozen Fruit	NC			46,105.29	50,254.76					
Canned Fruit	NC			351,620.08	147,680.44					
Frozen Citrus Juice	NC			220,838.93	247,339.60					
Canned/Chilled Fruit Juice	181,000.	112,220.		410,103.82	196,849.83					
Wine (Crushed Grapes)	137,000.[jj]	157,276.		330,092.32	528,147.71	70.	366,203.39			55,375.
Other Products			10,513.34							
Sugar	0.			1,702,487.	629,920.19	100.	629,920.19			354,684.7
Honey	7,006.	8,337.14		23,321.74	27,752.87	69.9	19,399.26			
Maple Syrup	3,465.[kk]	11,711.70		1,793.98	6,063.65			48.2	5,645.04	
Honey & Syrups			2,913.57							
Coffee, Tea, Cocoa	0.			213,483.62	674,608.23	100.	674,608.23			NA
TOTALS	11,847,087.45	6,327,686.5	1,220,406.32	24,416,411.58	18,411,530.44		11,598,178.37		2,112,046.84	20,788,659.[ll]



Retail Value of N.Y. Production **$6,327,686,500**
Retail Value of N.Y. Exports **-2,112,046,840**
Value of Production Remaining **$4,215,639,660 = 22.9% of Consumption produced in N.Y.**

N.Y. imports 77.1% of its food.

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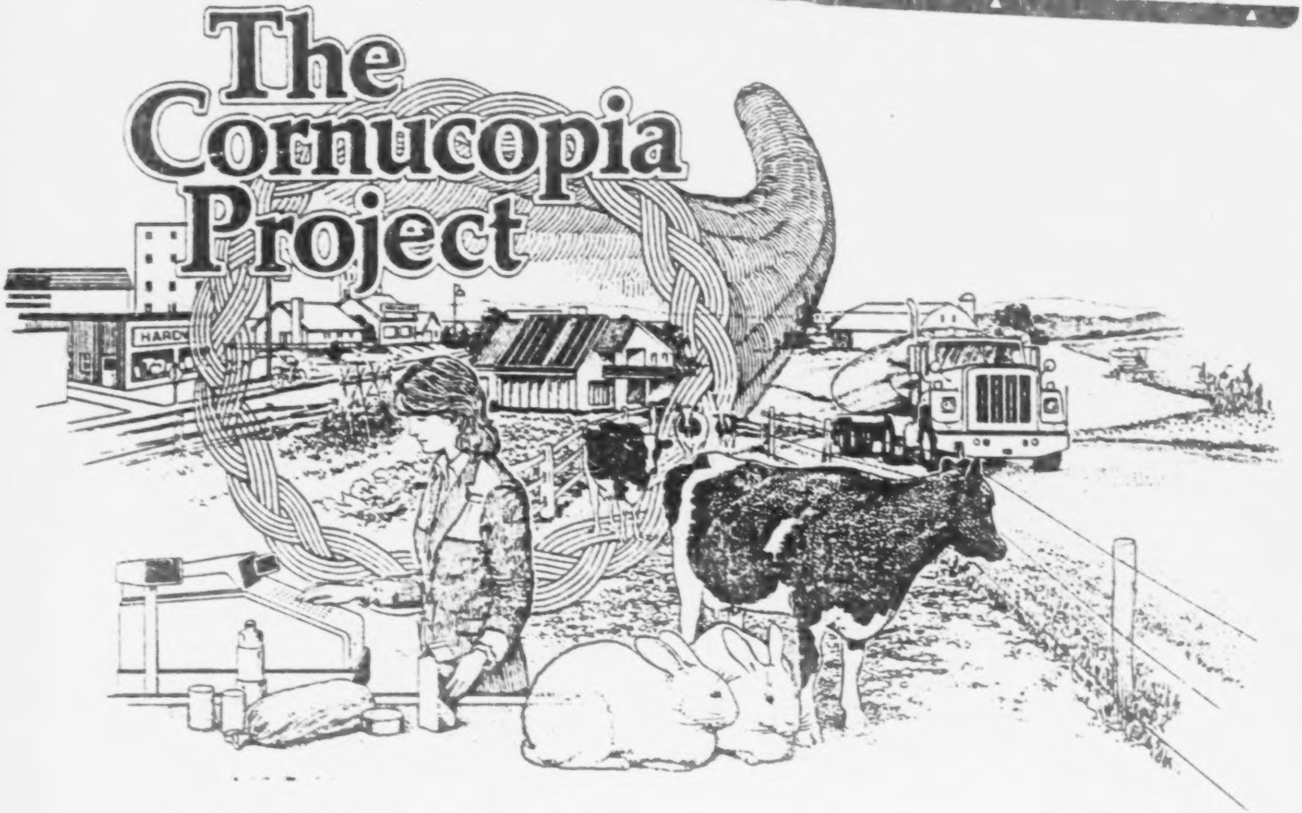
The Cornucopia Project
HARDY

THE MICHIGAN FOOD SYSTEM: INCREASING DEPENDENCE OR SELF-RELIANCE?

A Study of the Food System of Michigan by
RICHARD STRUTHERS and ROSEMARY LEWANDO
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TABLE OF CONTENTS

Introduction i

Issues of Concern 1

Opportunities for Change 8

Summary of Recommendations 18

Footnotes 20

Appendix 24

Michigan State Food Imports Chart 25

Footnotes to Imports Chart 29

INTRODUCTION

In Governor Willian G. Milliken's annual state of the state address on January 15, 1981, he focused on actions that would diversify and strengthen Michigan's economy by recognizing its inherent strengths and by building upon these strengths. Michigan's inherent strengths are its people, their will, and its natural resources. With the decline of the automobile industry, much attention has been given to Michigan's agricultural system to assess its potential contribution to our economy. The apparent strength of agriculture in Michigan is impressive.

The combination of climate, terrain, and soils of Michigan allows a highly diversified agriculture producing nearly 50 commercial crops each year.[1] Michigan leads the nation in production of blueberries, tart cherries, cucumbers for processing, and dry beans. Other important crops include apples, asparagus, celery, carrots, spearmint, sugarbeets, strawberries, and fresh sweet corn. Farm cash receipts were $2.5 billion in 1981,[2] ranking agriculture as Michigan's second leading industry. Michigan's food system employs about 450,000 people year-round and another 40,000 jobs are generated during the summer.[3] Agriculture provides stability to Michigan's economy.[4] Indeed, our agricultural system has many strengths. But in order to build on these strengths, revitalize our economy and assure sustainability, we must also recognize our weaknesses. Issues of great concern include:

- 64 percent of the food consumed in Michigan is produced outside the state.
- We spent $7.5 billion for this imported food in 1980.
- In the last 30 years, Michigan has lost 55 percent of its farms.

- Michigan loses productive agriculture land ten times the size of Lansing each year to non-farm development.

- The amount of soil lost to sheet and rill erosion is enough to bury the city of Lansing with about a foot of soil every two years.

- Together, erosion and development decrease our productive land base by 347,504 acres each year, an area more than three times the size of Detroit.

Perhaps these issues could be ignored for awhile if not for the fact that these problems are occurring throughout the nation. Every day the United States loses the productive equivalent of 25 square miles of agricultural land to erosion and development.[5] Farm debt is increasing astronomically, up 650 percent in the last 20 years.[6] Irrigated farmlands in the West, of which we depend for much of our food, are threatened by declining water tables and increasing salt build-up in the soil. The nation's food system, from production to transporting and processing, is dependent on scarce minerals and non-renewable energy, increasing our costs and vulnerability.

Seen in this context, strengthening the food system in Michigan is not only an opportunity to revitalize our economy, but also necessary to assure a more sustainable food supply. The purpose of this paper is to address our weaknesses and offer an opportunity to revitalize our food system.

ISSUES OF CONCERN

Our food system evolved in an era of cheap and plentiful energy. As national communications and transportation networks developed, different areas of the country began specializing in producing the commodities they grew best. Michigan has moved from being fairly self-reliant to becoming heavily dependent on it. While our food system has provided a vast array of food at relatively cheap prices, with the rising cost of energy, our dependence may spell trouble.[7] Trouble could turn to disaster if our options are limited by an unchecked and dwindling resource base.

Imported Food

Currently, producing only 36 percent of the food we consume means that we import 78 percent of our beef; 68 percent of our pork; 96 percent of our chicken; 78 percent of our cheese; 100 percent of our broccoli; 89 percent of our lettuce; 49 percent of our onions; 100 percent of our spinach; 68 percent of our fresh tomatoes; 78 percent of our cantaloupe; 89 percent of our grapes; and 53 percent of our pears. In addition, because of a lack of processing facilities in Michigan, all of our corn for grain and soybeans grown for processing must be exported and their processed products imported back into Michigan.[8] Importing so much food has some major disadvantages for Michigan. This dependence means that:

1) Our food supply is vulnerable to disruption.
2) We pay more for lower quality food.
3) Our system uses huge amounts of energy.
4) Our local economy is weakened.

Vulnerability to Disruption

The equivalent of 4,739 truckloads of food come into Michigan each week to keep us well fed.[9] Much of this food is transported from places as far away as California, Florida, and Mexico.[10] Because of this dependence, an oil embargo, energy shortage, labor dispute, drought or crop failure, or any other disruption could lead to serious food shortages. A quarantine of California produce, such as the near occurrence in July, 1981 because of the Mediterranean Fruit Fly infestation, would greatly reduce the availability of fresh food in Michigan, causing prices to increase substantially. If a disruption occurred in the food supplied to an average major supermarket in Michigan, perishable items would last one week and all other items at the most one month.[11] We have already witnessed the long lines at the gas pumps during fuel shortages; the effect would be much worse if such a basic need as food were in short supply.

Cost and Quality

Of the $11 billion Michigan residents spent for food in 1980, $7.5 billion was spent for food produced outside the state. This amounts to $804 spent per person for our imported food.[12] Transportation costs alone account for $600 million of Michigan's food bill.[13] In 1980 we shipped in a total of 13,125 truckloads of fruits and vegetables into our Detroit receiving point from out of the state.[14] At an average 1981 cost of $1.12 per mile,[15] the 1501 truckloads of fresh vegetables from California alone results in a $3.7 million transportation bill. The 1,044 truckloads of fresh fruit from California amount to a $2.6 million transportation bill. These transportation costs are not likely to decrease or even stabilize in the years ahead.

Another cost of relying on distant areas to produce much of our food is hidden in our tax bill. Much of the irrigation water used in California for example, is subsidized by the federal government. This subsidy hides the real cost of the imported food and poses a disadvantage to Michigan's farmers.

While the price of food on the average is relatively cheap, many people need government assistance to acquire enough of it. In 1975, 1.5 million Michigan residents would have been deemed malnourished if not for government assistance.[16] In the face of current and pending cutbacks in assistance, the situation could be critical. With the rising costs inherent in our food system through dependence on expensive energy, the situation could become devastating.

In addition, much of our imported foods suffer in nutritional value and taste. Many foods, especially fruits, are picked before they are ripe so they can be handled and transported long distances more easily. This practice often results in food of lower nutritional value since they are picked before nutrient content is at its maximum. The travel time itself can result in nutrient destruction. For example, it has been found that tomatoes ripened on the vine have 25 to 30 percent more vitamin C than those picked green and ripened by ethylene gas on the way to market.[17] In short, we are paying more for food of lesser quality.

Energy Waste

Transporting our imported food not only adds to the price of food, it wastes huge amounts of energy. And while trucks use three times the amount of energy per ton per mile as do railroads,[18] rail unloads into Detroit account for only 9 percent of the total and have been decreasing.[19] Energy is wasted not only through transporting imported food that could have been produced in Michigan, but in the distribution of Michigan grown food. As a component of the national food system, we supply other areas of the country with food which is out of season for them. While this practice provides a wide array of food, it can waste energy unnecessarily and needs to be checked.

Local Economy Depressed

Since about 20 percent of the retail food dollar stays with the retailer, $6 billion of our total $7.5 billion food import bill actually leaves the state; that's $16 million leaving the state each day. With $2.4 billion worth of food exports, that's quite an imbalance of trade.[20] In addition, much of what we export is unprocessed and is sold wholesale, so the actual value to Michigan of these exports is considerably less.

The money generated for the state from producing food is represented by economic multipliers. The income multiplier for food manufacturing is substantially higher than that for construction, finance and insurance or business and personal service.[21] Increasing our agricultural production to meet our current processing capacity would generate money and jobs. For example, if we increased our swine production to meet our current slaughter capacity, $800 million would be added to Michigan's economy and 3,000 additional jobs created.[22] The full value and jobs from processed corn and soybean and hard cheese would be captured by the state if we had the processing facilities.

Michigan needs to decrease its costs of transporting in food, and it needs the money and jobs generated from increased agricultural production and in-state processing. Not producing and/or processing over 35 percent of what Michigan residents consume contributes to a depressed economy.

It is clear that producing more of the food that we consume could be quite advantageous for many reasons. But, our ability to do so ultimately depends on our farm situation and the condition of our land base.

Farms

In 1900, Michigan had more than 200,000 farms and about 17.5 million acres of farmland. Today, we have about 72,000 farms on 11.4 million acres.[23] About 9 million acres of the land in farms is cropland, of which approximately 7 million acres is harvested cropland.[24] In the last 30 years, Michigan has lost ~~35~~ 36 percent of its farmland. This means that fewer, larger farms are farming fewer acres.

This phenomenon is due to many interrelated factors which affect the economy of farming. Escalating energy and input costs relative to prices farmers receive is one factor.[25] In 1980 net farm income averaged just $7,605 per farm in Michigan.[26] Many producers face fewer marketing opportunities due partly to fewer, larger commodity buyers willing to buy only large volumes. The capital costs associated with expanding the farm operation to supply larger volumes have put many Michigan farmers into a debt spiral. This situation isn't particular to Michigan, but is occurring throughout the nation.

Development

Michigan would need approximately 10 million acres of land to produce 100 percent of the food we consume that is possible to grow in this climate.[27] However, our ability to produce just 35 percent of our consumption is threatened.

Conversion of farmland to non-farm uses may be the most immediate threat to Michigan's productive capability.

The combination of low farm profitability and soaring land values places immense pressure on farmers to sell their land to developers. Between 1974 and 1979, 900,000 acres of farmland were converted to shopping malls, residential and commercial developments and other non-food producing uses.

This loss of 225,000 acres per year has rated us the second worst state in the nation[28] and amounts to losing productive agricultural land ten times the size of Lansing each year. In addition, over 100,000 more acres are isolated each year by leap-frog development, making the land unavailable for farming.[29] This amounts to losing good cropland the size of Detroit each year.

It has been cited that Michigan has about 600,000 acres of land not now in crops that have high potential for conversion to cropland.[30] However, this could offset the land lost to development for only two to three years. After that point, further development would necessarily mean less agricultural production.

Erosion

While conversion of farmland to non-food producing uses is obviously a threat, it is compounded by the fact that our farmland is decreasing in quality also. The USDA, SCS National Erosion Inventory estimates that Michigan's land loses 2.3 tons of soil/acre/year to erosion. On 9,459,000 acres of cropland, that amounts to 21,604,000 tons of soil eroded each year. Put another way, the amount of soil that is eroded from Michigan's cropland each year is enough to bury the city of Lansing with about a foot of soil every two years.[31]

It takes thousands of years to form productive topsoil. Once the plow layer (top 6 inches) is lost it is virtually irreplaceable. Every year, Michigan loses an equivalent of 22,504 acres of our plow layer.[32] By the year 2000, 427,579 acres would be rendered unsuitable for farming at this rate.

Since each acre-foot of soil contains two inches of water, 8,000 pounds of nitrogen and 2,000 pounds of phosphorus,[33] losing 2.3 tons/acre/year results in a total value lost of $24 million.[34] The $18 million worth of nitrogen lost plus the $6 million worth of phosphorus lost is equivalent to 12 percent of Michigan's 1980 total fertilizer consumption bill.[35] This does not include the value of the lost thousands of gallons of water.

In all, the continuation of erosion and development at current rates could leave Michigan with only about 3 million acres of cropland by the year 2000.[36] That's only 31 percent of our current plus potential cropland. If this happened, even if we devoted all of our farm production to meet in-state demand, we would have no choice but to import at least 70 percent of our food.

OPPORTUNITIES FOR CHANGE

Although the weaknesses of our food system are overwhelming, there is much we can do to strengthen it. Since Michigan is out of the way for major national transportation lines, with the rising cost of transportation Michigan has an advantage to produce more food to meet in-state and regional demand. In all, we would need about 10 million acres to produce all of the food we eat, that our climate permits.[37] Currently we use about 7 million acres and have about 2 million more designated as cropland which is not being used. If all this land were used we could produce about 90 percent of our food. Given Michigan's physical resources, we could not produce the coffee, cocoa, or citrus fruits that we consume. Just to produce all of the meat we eat would require an additional 5 million acres toward meat production. Thus, it is not desirable to limit our goal to complete food self-sufficiency. What we can do is move toward increased self-reliance, and center our efforts around reducing food costs, strengthening our economy, and decrease the vulnerability of our supply. Much can be done by individuals; other issues are best dealt with by collective, business, local or state government actions.

Consumer Actions

* Become more self-reliant: One approach to lessening our personal vulnerability, saving money, and reducing the load our food system must carry, is to garden and preserve more of our own food. According to a recent survey, 54 percent of the households in the Midwest had gardens in 1980.[38] Each garden produced an average of 588 pounds of food, valued at $460 per garden. Using this data we can assume that Michigan has about 1.7 million gardens producing a total of $794 million worth of food. If each of these gardens produced 1,183 pounds

of vegetables, all of Michigan's fresh vegetable needs could be provided. If all the households in Michigan had gardens producing 928 pounds each, all the state's vegetable needs could be met.[39] Of course many households do not have the conventional garden space available, but many do which are not utilizing it. These figures demonstrate the significant contribution gardens could, and already do, make to our food security.

In the Midwest, according to the survey, the average investment in a garden yielding 588 pounds of food was $19 in 1980. Subtracting this investment from the $460 food value per garden means a savings of $441 on the household food bill. That's a 2,320 percent rate of return on investment. For a little more investment and for those that do not have the garden space, vertical growth frames can be easily constructed. Solar growth frames or small greenhouses can be constructed to provide an assortment of fresh vegetables all year round. Small scale fish, rabbit or quail culture is another way for consumers to gain an edge on rising food costs and uncertain supply.

* Participate: The Cooperative Extension Service is set up to provide gardening information to households. This program should be adequately funded for out-reach to people with pertinent information, inexpensive and healthy gardening methods, as well as food preserving and storage information.

Michigan currently has many excellent church and community action groups designed to assist people in obtaining their food needs. Individuals can contribute much for themselves and their community through participating in these groups' efforts. Efforts include maintaining food banks, gleaning fields after mechanical harvesting, gardening information and utilizing vacant lots for community gardening. Currently, there is also a program implemented by the State of Michigan Office of Services to the Aging to assist in alternative food delivery systems for senior citizens.[40] This has initiated over nine community solar greenhouses in Michigan which are operated by senior citizens to provide food during the off-season. Grass roots activities such as these need to be supported and promoted, but ultimately depend on the participation of the individual who strives for food security.

* Be conscious of diet: Another way we can decrease our dependence on imported food is to become more conscious of what we eat. For example, it takes nine times as much space to produce a pound of beef as it does to produce a pound of chicken.[41] Increased poultry consumption could free up additional cropland for other crops, or at least decrease our dependence on imported red meat. Trends such as this are already occurring. A 1979 survey found that 15 to 20 percent of households interviewed had reduced their use of bacon, sausage, hot dogs and luncheon meats, eggs, beef, and fresh pork, while increasing their use of poultry and fish during the past three years; 25 percent had increased their fruit and vegetable consumption. The reasons cited were concern about fat, cholesterol, salt and sugar intake.[42] The accompanying food import chart reveals the production and importation of each food commodity. Utilizing this, people can alter their diet and consume more nutritious food produced in the state while decreasing the state's economic burden.

Collective Action

* Promote consumption of locally produced food: Demand for in-state produced food is currently being promoted through the "Good Things Growing in Michigan" campaign by the Michigan Department of Agriculture. This promotion campaign should be extended to all facets of the food system, particularily with labels

identifying Michigan produced food. The demand by individuals for state produced food is only the first step. The myriad of marketing channels through which food travels from the field to the table is complex.

The simplest way to obtain state produced food is through direct marketing. This includes roadside stands, house to house delivery, pick-your-own operations, and farm stores or markets. A report by the USDA found that in 1978, 36 percent of Michigan farmers sold commoditites through direct marketing, with a sales value of over $75 million.[43] The benefits of direct marketing include increased income for the farmer, fresher and cheaper food for the consumer, and a stronger link between producer and consumer. USDA studies of direct marketing in Colorado showed that local farmers received 44 percent higher gross returns from direct marketing than if they had sold through wholesale channels, while consumers paid an average 28 percent less than supermarket prices.[44] Other advantages of direct marketing include opportunities for consumers to buy food in bulk for home canning and preserving for off season use, and economic benefits for local merchants and banks. Michigan State University Cooperative Extension Service has initiated successful farmers' markets through their direct marketing program and have helped communities seeking assistance in starting municipal markets. In addition, the vast network of consumer food cooperatives in Michigan has provided Michigan farmers with an outlet for a variety of products, while keeping prices to consumers at a minimum. Legislative, community and business efforts to increase direct marketing opportunities, and support a strong consumer food cooperative network, could help Michigan's food situation substantially.

There are many other options and strategies for improving the marketing system to strengthen regional agriculture and Michigan's food system. Grading standards should be revised to reflect nutritional status, product end uses and maturity and eating quality rather than external appearance. The establishment of regional storage facilities to grade, pack and distribute the output of small local producers to provide large buyers with the volumes and specifications they demand could be instituted. These centers could be started with public funds and become self supporting through fees paid by producers. Another option that could be implemented is state purchase of Michigan grown crops. If locally produced foods were purchased by Michigan's hospitals, schools, prisons and other institutions, expanded markets would be provided to our farmers while decreasing our transportation costs. Included in this area is the option of mandating the use of public farmlands for the production of crops for local consumption.

Along with incentives for marketing locally produced food, efforts are needed to provide a profitable business climate for processors in the state. There are efforts underway to study the feasibility of a soybean processing plant in Michigan. This action is also needed for hard cheese processing. Another option is encouraging on-farm processing, as well as research on energy efficient packing methods.

* Help out the producers: Increasing the direct marketing and in-state processing would help the economic situation of agricultural producers by providing new markets. Other actions are needed as well to assist new farmers. Currently the average age of farmers is over 50,[45] and because of the precarious economic situation many young "would be" farmers are opting to leave food production for non-farm employment opportunities. Some options might

include providing guaranteed state loans to beginning farmers, with deferred or reduced payments for a limited time. Also the development of "entry packages" for new farmers that would include help in obtaining the needed quantities of land, capital, agronomic advice along with managerial and organizational assistance could increase opportunities for beginning farmers. Currently there are community development group actions as well as state and federal initiated programs to provide assistance to producers. Expanding these efforts to attract new farmers would benefit the food security of the state.

* Curb Development: Perhaps the area of most immediate concern requiring collective action is the protection of our agricultural land base. The continuation of our current annual rates of erosion and development will make importing more and more food a necessity in the future unless we act now. Making an inventory and mapping all prime and unique farmland in Michigan would be a good start in addressing these problems. Such an inventory would include identification of all agricultural lands, their potential, current status and likely availability for new farmers or farming ventures.

The next step of actually protecting farmland is one that is complex and which requires a variety of responses. Michigan has already begun to address the problem of development that threatens our farmland base. Michigan's Farmland and Open Space Preservation Program (Public Act 116) helps to protect farmland from development by offering a limited income tax credit to farmers in return for their agreement not to develop or change the use of their land for varying lengths of time. While currently 6,000 farmers with 1.4 million acres of farmland have enrolled in this program, agreeing not to let their land be developed for an average of about 20 years, more participation needs to be encouraged,[46] especially near urban growth areas where farmland needs the most protection. It is on the urban fringe, where property values are the highest, that farms are lost to development at the highest rates.

Perhaps a use-value property tax assessment system, whereby farmland is taxed based on the value of its agricultural productivity rather than its value as residential or commercial property could ease some of the high tax burden farmers currently must bear.

The recently passed "Right-to-Farm" Bill is another effort to ease the pressures of urban sprawl by protecting Michigan farmers from nuisance suits brought by suburban neighbors, as long as the farmers follow "accepted" farming practices.[47]

Possibly the best long term solution of the development problem is to help farmers close to urban centers become more profitable by increasing their contribution to the local food supply. This would link their existence to the health of the community to a greater extent, and promote heightened awareness by both producers and consumers of each other's situations.

Other strategies that could be employed include the institution of capital gains tax on farmland sales and speculation, the establishment of property tax at the time of sale of farmland that will stay the same until the property is sold again, and the institution of a heavy tax on profits made on development of previously agricultural land. Another approach might be to set up state chartered corporations with the authority to buy farmland for sale and resell it to farmers willing to commit themselves to commercial production. This could be linked with designating agricultural preserves composed of at least 70 percent of the prime farmland within the borders of each municipality.

* Decrease Erosion: The soil erosion problem in Michigan could be

publicized to reveal its real cost to both farmers and consumers. As energy and raw material prices continue to escalate, many farmers may think twice about the $24 million worth of fertilizer lost year to erosion. Substitution of chemical inputs for good topsoil will become increasingly expensive. At a recent Midwestern Governor's Conference a "Soil Depletion Tax" on the region's food exports was proposed to help compensate for the loss of natural resources.[48]

Other possiblities include incentive packages at state and federal levels to encourage good conservation and land management principles, the linking of state purchase of farm commodities to soil conservation programs, and increased public awareness of the need to support sound soil conservation practices. Specific tax incentives could be implemented for conservation techniques such as contour and minimum tillage, strip cropping, crop rotation and the use of cover crops.

* Conserve Energy and Natural Resources: Actions to conserve energy and natural resources could also contribute greatly to the sustainability of Michigan's food system. Increasing local fertilizer production is one possibility. In 1980, 645,650 tons of primary fertilizer nutrients were applied by farmers.[49] Much of this was imported to Michigan from distant areas. Meanwhile, each year the livestock, poultry and humans in Michigan produce the equivalent of nearly one quarter of the fertilizer needed by our farmers.[50] Establishing an Agricultural Waste Council in the Michigan Department of Agriculture to develop desirable legislation and other measures to facilitate the recycling of these organic wastes is needed.

One excellent example of recycling wastes to boost agricultural productivity in Michigan is the Muskegon County Land Treatment System. This System uses the effluent waste from the county for irrigation water on 5,000 acres of corn. In 1976 a yield of 81 bushels per acre (compared to a county average of 45 to 50 bushels per acre) brought $1 million in revenue.[51] Besides the gains of increased crop production, and the creation of revenue, this System has brought about significant improvements in the water quality of nearby lakes and streams.

Other options for conserving energy and natural resources in Michigan's food system include developing incentives for water conservation measures, such as investment tax credits for drip irrigation equipment (as opposed to more wasteful types), developing incentives for increasing the recycling of crop residues from food processing operations for energy and fertilizer for farm soils, promotion of energy production from agricultural lands in a way consistent with soil and water conservation principles, and providing investment credits for construction of energy conserving barns, and other conservation projects as well as the current credits provided for greenhouses and other solar construction.

A significant contribution to our understanding of energy use in Michigan's food system has already been made. The Farm Energy Audit Study conducted by Michigan State University has collected detailed data on energy used for numerous purposes in a variety of farm enterprises.[52] Using the results of this study, the comparative energy efficiency of various agriculture systems can be determined and conservation programs can be developed.

On-farm energy conservation programs could be linked with research and

and programs to reduce soil erosion and examine more sustainable farming methods. The excellent work in Integrated Pest Management by the Entomology Department at Michigan State University is an example of this type of research and development. Granting additional funds to Michigan State University or orienting existing research funds in these directions could help Michigan farmers cope with rising energy prices and help assure a plentiful long-term food supply. Such organizations as the Michigan Agricultural Experiment Station, The Kellogg Biological Station, and the Cooperative Extension Service should be encouraged to expand along these lines.

SUMMARY OF RECOMMENDATIONS

It is not feasible to trace out all of our options in this report. The point is that we do have opportunities to revitalize our food system. The Cornucopia Project has a task force engaged in making a comprehensive inventory of programs that other states, countries, or research organizations have either instituted or proposed to deal with problems in the food system. The following outline summarizes the general actions Michigan must take to effectively deal with its food problems.

A. State Plan for Michigan's Food System

This plan should incorporate measures which will realize the following broad policy objectives:

1. Inventory, map, and protect all remaining prime farmland from development and speculation.
2. Preserve our soil by instituting widespread and effective soil conservation programs.
3. Develop incentives for farmers to produce a greater diversity of crops for local consumption.
4. Conserve energy and natural resources.
5. Orient state agricultural research to focus more on sustainable farming methods and local food production.
6. Preserve and strengthen the family farm.
7. Develop regional and community food plans.

B. Emergency State Food Plan:

This plan should incorporate measures which will deal with the following contingencies:

1. A complete oil cutoff to the United States from all OPEC countries.
2. A multi-year drought in Michigan's present-day major food supply areas.
3. A near shutdown for one to four weeks of the U.S. trucking and rail system.
4. A widespread labor dispute in Michigan's present-day major food supply centers that could cutoff the flow of food into Michigan.
5. An extraordinary leap in food prices so that only the wealthiest people in Michigan could afford food.

Creative planning and action to take advantage of our opportunities could guide Michigan to increased self-reliance and economic viability, enhance the nutritional quality of the food we eat, decrease our vulnerability in times of national and international economic stress, and make Michigan's food system more sustainable. The problems we face are real and growing and if left unchecked, our food system may crash. If Michigan is truly concerned about the condition of its future food system, the state must be willing to develop and implement a realistic plan of action. This will take time and money and the involvement of everyone. The longer we wait, the fewer our opportunities. The time to begin is now.

Footnotes

1. An Agricultural Presentation Strategy for Michigan, Report to Governor W. G. Milliken by The Community Development Cabinet (Lansing, MI, November, 1980) p.i.

2. Proceedings of The Michigan Governor's Conference on Agriculture, (Lansing, MI, April 1-2, 1981) Conference speech by Richard Lyng, p. 10.

3. Ibid, Remarks by Governor Milliken, p. 8.

4. Karl T. Wright and John N. Ferris, Michigan Agriculture, Going into the Eighties, Michigan State University Cooperative Extension Service, APR 25, March, 1981, p. 1.

5. Neil Sampson, "The Ethical Dimension of Farmland Protection," Farmland, Food and the Future (Ankeny: Soil Conservation Society of America, 1979) p. 93.

6. "Farmers Face a Credit Squeeze," New York Times, 21 March, 1980. Pp. D1, D5.

7. Thomas C. Edens and Herman E. Koenig, "Agroecosystem Management in a Resource Limited World," American Institute of Bio Sciences, Vol. 30, No. 10, 1980, Michigan Agricultural Experiment Station Journal Article No. 9534.

8. Michigan Grain and Agri Dealers Association, telephone conversation, August, 1981.

9. Michigan Food Imports: as determined by Food Production and Consumption by Weight and Retail Value Chart, (Emmaus, PA, Rodale Press 1982). 15,149,838,890 lbs of food consumed in Michigan x 65% imported = 9,847,394,700 lbs imported ÷ 40,000 lbs (average truckload weight) ÷ 52 weeks = 4,734 truckloads per week.

10. U.S. Department of Agriculture, Fresh Fruit and Vegetable Unloads in Midwestern Cities 1980, Agricultural Marketing Service, Fruit and Vegetable Division, 1981.

11. Chatam Supermarkets, Detroit, Michigan and Kroger Supermarkets, Lansing, Michigan, Telephone conversations, Summer 1981.

12. Michigan Food Imports Chart, op. cit., $7.4 billion worth of food imported ÷ 9,258,344 people in Michigan (1981) = $799.28 per person.

13. U.S. Department of Agriculture, 1980 Handbook of Agricultural Charts, Agricultural Handbook #574, Chart 90, p. 39. Transportation costs are 8% of farm food marketing bill; .08 x $7.4 billion import food bill (Michigan Food Imports Chart) = $592 million.

14. U.S. Department of Agriculture, Fresh Fruit and Vegetable Unloads in in Midwestern Cities 1980, op. cit.

15. U.S. Department of Agriculture, "Fruit and Vegetable Truck Rate Report for July, 1981," Vol. 3, No. 7.

16. A Matter of Justice: A Report on Hunger and Malnutrition, State of Michigan, prepared by The House Committee on Public Health, Health Project (Lansing, Michigan, 1975) p. 1.

17. Robert Harris and Endel Karmas, Nutritional Evaluation of Food Processing (Westport, CT: The AVI Publishing Co., Inc. 1975) p.103.

18. Proceedings of The Northeast Agricultural Leadership Assembly, Vol II (Cherry Hill, NJ, March 20-22, 1979). Speech by Walter Vegara, "Toward Optimization of Energy Consumption in Food Distribution," p. 257.

19. U.S. Department of Agriculture, Fresh Fruit and Vegetable Unloads in Midwestern Cities 1980, op. cit.

20. Michigan Food Imports Chart, op. cit.

21. David L. Call, Director of New York State Cooperative Extension, "The Role of Agriculture in the Economy of New York State," a summary of remarks presented at the Agricultural Forums, April, 1977.

22. Proceedings of The Michigan Governor's Conference on Agriculture, op. cit., The Livestock and Poultry Committee, p. 99.

23. Michigan Agricultural Statistics 1981. Michigan Agricultural Reporting Service, Michigan Department of Agriculture (Lansing, MI 1981),p. 5.

24. Karl T. Wright and John N. Ferris, op. cit., p. 2.

25. Ibid. p. 9.

26 Michigan Agricultural Statistics 1981, op. cit. p. 10.

27. Michigan Food Imports Chart, op. cit.

28. Aglands Exchange, National Association of Counties Research Foundation, Washington, D.C., Vol.1, No. 3, February/March, 1980.

29. An Agricultural Presentation Strategy for Michigan, op. cit.

30. U.S. Department of Agriculture Soil Conservation Service, "National Resources Inventory," 1977.

31. 21,604,000 tons of soil eroded/year ÷ 1920.5 tons/acre foot = 11,249.154 acre feet lost/year ÷ 21,376 acres (Area of Lansing = 33.4 sq. miles x 640 acres/sq mile) = .5263 foot of soil to cover the area of Lansing/ year.

32. 21,604,000 tons of soil eroded each year ÷ 160 tons/inch/acre = 135,025 acre inches/year ÷ 6 inches = 22,504.17 acre 6 inches deep lost/year.

33. W. E. Larson, "Soils and Soil Conservation: The Natural Resource Base," *Contribution of Science and Education Administration Agricultural Research, North Central Region*, USDA, Paper No. 11383, Scientific Journal Series. (Paper prepared for the Soil and Water Resources Research Priorities Workshop, Madison, Wisconsin, February 23-27, 1981) p. 9.

34. 11,249.154 acre feet lost/year x 8,000 lbs N/acre foot 89,993,232 lbs lost/year x \$.199/lb N = \$17,908,653. 11,249,154 acre feet lost/year x 2,000 lbs P/acre foot = 22,498,308 lbs P lost/year x \$ .263/lb P = \$5,918,033. Prices based on figures given in *Michigan Agricultural Statistics 1981*, op. cit., p. 16.

35. *Michigan Agricultural Statistics 1981*, op. cit. Value of fertilizer used in Michigan = \$204.7 million, \$24 million worth of fertilizer lost in eroded soil ÷ \$204.7 million = 11.7% of total.

36. 22,504 plowlayer acres lost to erosion/year + 325,000 acres lost to development/year = 347,504 acres lost/year in total x 19 years until year 2000 = 6,602,576 lost. 9.6 million current and high potential cropland - 6.6 million = 3 million acres left by year 2000.

37. *Michigan Food Imports*, op. cit.

38. Gardens for All, *National Gardening Survey 1980-1981*, prepared by The Gallup Organization, Inc. for the National Association for Gardening, Burlington, Vermont.

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40. David H. Houseman, Office of Services to the Aging, Lansing, MI, Alternative Food Delivery Systems Project. Paper submitted to the Great Lakes Solar Greenhouse Conference III, (Chippewa Nature Center, MI, Oct. 17, 1980).

41. *Michigan Food Imports*, op. cit. Michigan beef production = 170,252,760 lbs on 1,093,328 acres; Chicken production = 19,717,920 lbs on 14,069.77 acres. It takes .006422 acres/lb beef and .000714 acres/lb chicken.

42. Judy Lea Jones and Jon Weimer, "Health-Related Food Choices," *Family Economics Review*, Summer, 1981, pp. 16-18.

43. U.S. Department of Agriculture, Farmer-to-Consumer Direct Marketing in Six States, Agriculture Information Bulletin No. 436, prepared for the National Economics Division; Economics, Statistics and Cooperative Service, by Peter L. Henderson and Harold R. Lingstrom (Washington, D.C.: Government Printing Office).

44. "Direct Marketing Proves Its Worth," The New Farm, March/April 1981, p. 51.

45. U.S. Department of Agriculture, Economics, Statistics and Cooperative Services, Structure Issues of American Agriculture, Agricultural Economic Report 438, November, 1979, p. 116.

46. An Agricultural Preservation Strategy for Michigan, op. cit., p. 17.

47. "Michigan Right-To-Farm Act Now In Effect," The Great Lakes Fruit Growers News, July, 1981, p. 19.

48. Midwestern Governors' Conference, "Policy Statement on Soil Depletion Tax," (Milwaukee, Wisconsin, August 30- September 1, 1981).

49. Michigan Agricultural Statistics, op. cit., p. 9.

50. Michael Bewick, ed. Handbook of Organic Waste Conversion (New York: Van Nostrand Reinhold Company, 1980), pp. 73-80, and U.S. Department of Commerce, Estimating U.S. Livestock and Poultry Manure and Nutrient Production, Economics, Statistics, and Cooperative Service, 1978, p. 9.

51. U.S. Environmental Protection Agency, "Wastewater: Is Muskegon County's Solution Your Solution?" 1976 update. EPA Region V publication, Chicago, Illinois, 1976.

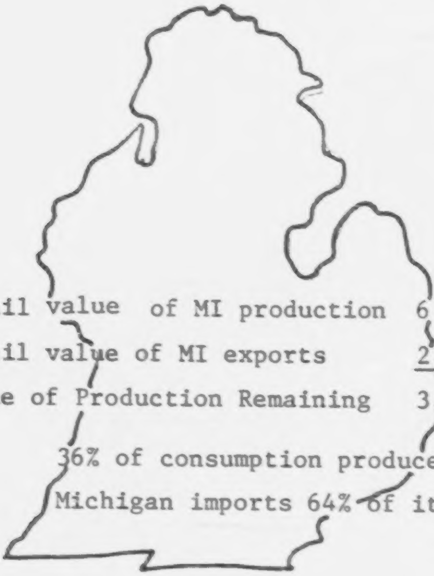
52. The Michigan Farm Energy Audit Study, Michigan State University, Cooperative Extension Service (East Lansing, Michigan, 1981).

APPENDIX

MICHIGAN FOOD IMPORTS

Despite a highly diversified agriculture system that produces nearly fifty commercial crops each year, 64 percent of the food consumed by Michigan residents is imported from other states. Although Michigan produces important crops such as blueberries, dried beans, apples, carrots, strawberries and fresh sweet corn, each person in Michigan pays over $800 every year for food imported from as far as California, Washington, and Texas. Transportation costs for this imported food account for $600 million of Michigan's food bill.

However, given Michigan's climate, terrains, and soils, in-state production of many foods could be increased. In addition to producing more food locally, there are other ways to increase Michigan's food self-reliance, including expanding direct marketing, encouraging in-state food processing facilities, and preserving farmland. By acting on these and other issues, Michigan residents can begin to build a sustainable food system.



Retail value of MI production	6,375,687.57
Retail value of MI exports	2,377,854.81
Value of Production Remaining	3,997,832.76

36% of consumption produced in MI

Michigan imports 64% of its food

MICHIGAN STATE FOOD IMPORTS

As determined by food production and consumption by weight and retail value

	PRODUCTION		CONSUMPTION						
	Retail Weight[a] (1,000 lbs)	Retail Value[b] ($1,000) (1981 $)	Retail Weight[c] (1,000 lbs)	Retail Value ($1,000) (1981 $)	% Import[e]	Retail Value[f] of Import ($1,000)	% Export[g]	Retail Value[h] of Export ($1,000)	Acres Required[i] to Produce 100% of MI Consumption
Meats[j]									
Beef	170,252.76	379,663.65	788,900.	1,759,247.	78.4	1,379,249.6			5,066,134.2
Veal	5,164.52	13,324.45	16,479.85	42,518.02	68.7	29,209.88			k
Lamb & Mutton	4,343.41	7,600.97	12,776.52	22,358.9	66.	14,756.88			121,393.15
Pork	203,340.91	333,479.09	635,490.	1,042,203.6	68.	708,698.45			1,360,024.2
Lard (pork)	20,784.42	16,627.54	24,071.69	19,257.35	13.7	2,638.25			l
Poultry									
Chicken	19,717.92	22,872.79	476,800.	553,388.	95.9	530,411.39			340,222.26
Eggs	185,159.26	87,024.85	331,450.	155,781.5	44.1	68,699.64			223,630.72
Turkey	29,783.	29,485.17	93,509.27	92,574.18	68.2	63,135.59			91,217.2
Fish									
Fresh water	3,500.[m]	11,200.	62,030.91	198,498.9	94.4	187,382.96			
Salt water	NA	0.	58,327.57	200,646.83	100.	200,646.83			
Dairy									
Butter	36,709.	68,278.74	42,588.38	79,214.39	13.8	10,931.59			
Cheese	35,343.	106,029.	162,946.85	408,840.55	78.3	382,762.15			
Cond/Evaporated Skim	68,752.	41,251.2	31,478.37	18,887.02			54.2	22,358.15	
Cottage Cheese	66,595.	107,217.95	42,588.38	68,567.30			36.1	38,705.68	
Cream[n]	121,520.68	136,103.16	54,624.23	61,179.14			55.	74,856.74	
Fluid Milk[o]	3,358,108.1	906,689.16	2,560,900.	691,443.			23.7	214,885.33	
Ice Cream	164,866.	194,541.88	162,021.02	191,184.8			1.7	3,307.21	
Ice Milk	47,808.	35,856.	69,437.58	52,078.19	31.2	16,248.39			
Sherbert	9,864.	7,398.	12,035.85	9,026.89	18.	1,624.84			
Non Fat Dry	66,214.	77,470.38	19,442.52	22,747.75			70.6	54,694.09	
Other[p]	33,732.80	55,321.80	78,695.92	129,061.32	57.1	73,694.01			
Total	4,009,512.58	1,736,157.3	3,236,759.10	1,812,230.35	26.8	485,260.98	23.5	408,807.2	1,935,278.8[a]
Exported Grain[r]									
Corn	8,263,716.4	471,858.21	0.	0.			100.	471,858.21	
Soybean Meal	454,159.64	55,634.56	0.	0.			100.	55,634.56	
Grains[s]									
Barley	774.43	302.03	11,110.01	4,332.91	93.	4,029.60			7,230.37
Corn: Cereal, Flour, Meal			131,468.48	52,318.9					
Syrup, Sugar, Starch			464,768.87	306,747.45					
Total[t]	1,348,620.	77,006.20	596,237.35	359,066.35	100.	359,066.35	100.	77,006.20	172,571.22
Oats	29,793.02	20,855.12	29,626.70	20,738.69			.6	125.13	26,650.39
Popcorn	18,980.	9,110.4	22,220.03	10,665.61	14.6	1,557.18			8,080.01
Rice	0.	0.	85,176.77	74,955.56	100.	74,955.56			NA
Rye	3,319.14	929.36	7,406.68	2,073.87	55.2	2,073.87			6,888.65
Soybeans: Flour, Grits	35,750.4	26,097.79	18,516.69	13,517.18			48.2	12,579.14	9,840.93
Wheat, Soft: Flour, Cereal[u]	1,597,805.9	447,385.65	295,804.09	82,825.15			81.5	364,619.3	130,287.21
Hard	0.	0.	839,731.8	235,124.9	100.	235,124.9			396,860.73

MICHIGAN STATE FOOD IMPORTS (Continued)

As determined by food production and consumption by weight and retail value

	PRODUCTION		CONSUMPTION						
	Retail Weight[a] (1,000 lbs)	Retail Value[b] ($1,000) (1981 $)	Retail Weight (1,000 lbs)	Retail Value[d] ($1,000) (1981 $)	% Import[e]	Retail Value[f] of Import ($1,000)	% Export[g]	Retail Value[h] of Export ($1,000)	Acres Required[i] to Produce 100% of MI Consumption
Veg. Oil (Corn, Soy)[v]									
Margerine			106,470.96	88,370.90					
Oils			213,867.75	158,262.14					
Shortening			174,982.7	101,489.97					
Total	362,232.42	42,111.94	495,321.41	348,123.	100.	348,123.	100.	42,111.94	v
Vegetables									
Artichokes: Fresh	NA	0.	3,703.34	2,925.64	100.	2,925.64			
Asparagus: Fresh	6,370.00[+]	8,854.30	2,777.50	3,860.73			56.4	4,993.83	
Canned			2,777.50	5,221.71					
Frozen			704.67	1,481.34					6,329.45
Total Processed	16,440.00	23,609.93	3,518.17	6,703.05			70.7	16,701.66	
Broccoli: Fresh	6.41[+]	6.41	12,035.85	12,035.85	99.9	28,899.69			
Frozen	NC		12,683.93	12,683.93					4,817.58
Cabbage: Fresh	42,780.	11,430.82[b]	74,992.59	21,072.92	56.1	14,579.87			
Sauerkraut	NC		12,035.85	4,934.70					6,363.66
Carrots: Fresh	109,513.	398,662.73	54,624.23	19,883.22			37.9	151,212.77	
Canned			4,629.17	1,990.54					3,312.20
Frozen			10,091.60	7,366.86					
Total Processed	45,960.	17,532.33	14,720.77	9,357.40			46.6	61,429.23	
Cauliflower: Fresh	4,600.	4,445.21[b]	11,110.01	11,332.21	74.1	3,474.43			
Frozen	NC		4,629.17	5,786.47					3,544.62
Celery: Fresh	128,991.[+]	70,816.06	64,808.41	35,579.82			49.8	35,238.07	1,449.85
Corn, Sweet: Fresh	70,932.	16,016.45[b]	62,956.74	19,831.37	66.9	32,299.56			32,032.83
Canned	NC		50,920.89	22,405.19					
Frozen[w]	NC		9,536.09	6,007.74					
Cucumbers: Fresh	19,228.00	10,017.79	36,107.54	18,812.03	46.8	8,794.62			3,282.50
Pickles	210,160.00	134,502.4	79,621.76	37,912.70			71.81	69,358.53	5,327.21
Dry Edible Beans	744,800.	464,755.20	59,253.40	369,753.32			92.	427,760.69	4,455.14
Dry Field Peas	0.	0.	3,703.34	1,555.40	100.	1,555.40			1,424.36
Eggplant	121.50[+]	95.99	5,555.01	4,388.46	97.8	4,292.35			277.75
Escarole	NC		6,480.84	3,175.61	100.	3,175.61			360.05
Garlic	NC		8,332.51	66,660.07	100.	66,660.07			347.19
Lettuce	23,436.00	13,299.93	224,051.92	127,149.46	89.5	113,849.63			10,669.14
Mushrooms: Fresh, Canned[x]	11,000.00	20,350.00	24,997.53	46,120.44	56.0	25,827.45			NA
Onions: Fresh	169,200.	194,521.63[b]	102,767.62	53,490.55	49.2	189,026.67			13,332.02
Processed	NC		31,015.45	330,397.89					
Peppers	11,592.	18,338.54	29,626.70	46,869.44	57.5	26,935.87			4,003.61

MICHIGAN STATE FOOD IMPORTS (Continued)

As determined by food production and consumption by weight and retail value

	PRODUCTION		CONSUMPTION						
	Retail Weight[a] (1,000 lbs)	Retail Value[b] ($1,000) (1981 $)	Retail Weight (1,000 lbs)	Retail Value[d] ($1,000) (1981 $)	% Import[e]	Retail Value[f] of Import ($1,000)	% Export[g]	Retail Value[h] of Export ($1,000)	Acres Required[i] to Produce 100% of MI Consumption
Potatoes: Fresh	814,368.	232,257.75[b]	469,398.04	123,921.08	30.1	98,425.91			51,326.63
Canned	NC		12,961.68	4,536.59					
Chips, Flakes, Other	NC		220,348.59	198,538.71					
Pumpkin/Squash: Canned	2,426.77	800.83	5,555.01	1,833.15	83.9	1,538.02			614.45
Snap Beans: Fresh	8,742.00	6,031.98	12,035.85	8,304.73	27.4	2,273.01			3,761.20
Canned			55,550.06	20,553.52					
Frozen			11,387.76	8,768.58					
Total Processed	76,720.	41,601.61	66,937.82	29,322.10			30.93	12,867.38	9,462.36
Spinach: Fresh	NC		3,703.34	2,370.14	100.	2,370.14			336.67
Processed	NC		14,165.27	8,247.33					
Sweet Potatoes: Fresh	23.40+	10.41[b]	37,033.38	14,813.35	99.9	22,338.47			2,230.73
Canned	NC		10,184.18	7,536.29					
Tomatoes: Fresh	31,790.	29,564.7	99,990.12	92,990.81	68.2	63,429.03			9,090.01
Total Processed	147,360.00	26,537.41	221,274.42	117,189.16	78.2	91,677.08			27,547.29
Minor Veg.[y] Fresh	5,449.19	1,775.89[b]	20,368.36	10,184.18	93.4	25,254.00			
Canned	NC		42,588.38	7,611.47					
Frozen	NC		23,516.19	9,242.90					
Fruits									
Apples: Fresh	225,600.00[z]	135,811.2	153,688.51	92,520.48			31.9	43,323.77	12,674.03
Canned	163,000.	58,746.64	23,145.86	15,507.73			73.6	43,237.53	
Frozen	57,000.	35,497.01	3,147.84	3,273.75			90.8	32,231.29	
Juice, Cider, Other	225,000.	6,600.	87,121.02	37,976.97			44.18	2,915.88	
Apricots: Processed	107.45+	86.82	4,814.34	5,093.02	98.3	5,006.44			
Avocados	NA		11,110.01	8,110.31	100.	8,110.31			NA
Bananas	NA		198,128.56	78,062.65	100.	78,062.65			
Berries: Fresh	38,869.80	56,703.26[b]	2,036.84	2,036.84			89.89	5,159.02	901.10
Canned	NC		925.83	1,259.14					
Frozen	NC		1,203.59	2,443.28					
Cranberries: Fresh	0.	0.	1,851.67	925.84	100.	4,110.71			359.90
Canned			7,406.69	3,184.87					
Strawberries: Fresh	12,604.00	10,259.66	16,665.02	13,565.33	24.4	3,309.94			4,034.36
Processed	3,900.	5,433.71	10,739.68	13,317.20	59.2	7,883.78			
Cherries, Sweet: Fresh	3,680.	5,262.40	370.33	529.58			90.7	4,773.00	1,281.81
Processed[aa]	54,000.	35,410.50	7,406.68	4,856.93			85.87	30,346.80	
Cherries, Tart: Fresh, Other[bb]	5,520.+	1,529.04	5,520.	1,529.04					1,008.47
Canned	52,000.+	50,440.	462.92	449.03			99.1	444.99	
Frozen	91,000.	68,250.	4,166.26	3,124.69			94.9	2,965.33	
Citrus: Fresh	NA	0.	222,200.26	145,096.77	100.	333,652.31			
Processed			217,941.52	188.555.54					

MICHIGAN STATE FOOD IMPORTS (Continued)

As determined by food production and consumption by weight and retail value

	PRODUCTION		CONSUMPTION						
	Retail Weight[a] (1,000 lbs)	Retail Value[b] ($1,000) (1981 $)	Retail Weight (1,000 lbs)	Retail Value[d] ($1,000) (1981 $)	% Import[e]	Retail Value[f] of Import ($1,000)	% Export[g]	Retail Value[h] of Export ($1,000)	Acres Required[i] to Produce 100% of MI Consumption
Dates & Figs: Dried	NA	0.	4,166.26	6,624.35	100.	6,624.35			
Grapes: Fresh	3,094.	3,867.50	28,700.87	35,876.08	89.2	65,520.83			
Juice, Other[cc]	89,000.	63,535.85	23,516.19	37,577.77	90.1	33,838.78			130,036.26
Melons: Cantaloup	16,560.00	7,783.20	75,918.42	35,681.66	78.2	27,898.46			6,326.54
Watermelon	20.78 +	3.74	104,619.39	18,831.47	99.9	18,827.73			1,046.19
Olives	NA	0.	11,110.01	27,775.03	100.	27,775.03			
Peaches/Nectarines: Fresh	37,642.62	26,885.86	50,920.89	35,644.62	63.	44,313.78			12,715.41
Processed			49,254.39	34,694.72					
Pears: Fresh	19,000.	10,917.4	23,145.86	15,067.96	53.	12,362.99			5,657.57
Processed			16,757.60	8,258.44					
Pineapple/Papaya: Fresh	NA	0.	12,961.68	6,480.84	100.	59,440.17			
Processed			66,199.16	52,959.33					
Prunes/Plums: Fresh	10,640.‾	6,277.60	15,739.19	9,286.12	32.4	3,008.70			7,122.47
Canned, Juice			9,443.51	5,938.30					
Frozen			1,296.17	1,451.71					
Dried			4,258.84	5,749.43					
Total Processed	13,800.00‾	12,059.82	14,998.52	13,139.44	47.4	6,230.72			
Nuts									
Tree Nuts	16.80	137.26	16,665.02	36,153.21	99.9	136,017.06			208,312.74
Peanuts, Other	0.	0.	70,363.41	74,298.21	100.	74,298.21			
Sweets									
Honey	4,386.	6,579.00	12,035.85	18,053.77	63.6	11,474.98			
Sugar	573,333.33[dd]	229,333.33	843,435.14	337,374.06	32.	107,959.70			142,735.18
Cane Syrup/Molasses	0.	0.	3,703.34	4,814.34	100.	4,814.34			
Maple Syrup	1,001.00	2,042.04	925.83	1,888.69			7.51	153.36	
Spices & Herbs[ee]	107.00	1,671.34	14,813.35	231,384.53	99.3	229,718.56			
Coffee, Tea, Cocoa	NA	0.	110,174.29	335,466.83	100.	335,466.83			
TOTALS	21,169,602.18	6,375,687.51	12,954,192.30	11,085,905.93		7,170,350.79		2,377,854.81	10,636,220.57

FOOTNOTES FOR IMPORTS CHART:

NC Not Collected

NA Not considered applicable to Michigan's physical capabilities

+ 1980 production for this commodity is at least 20% above the 1978,'79,'80 production average.

- 1980 production for this commodity is at least 20% below the 1978,'79,'80 production average.

a Production weights obtained from: Michigan Agricultural Reporting Service, Michigan Agricultural Statistics, July 1981; USDA Crop Reporting Board, Dairy Products, Annual Summary, 1980; Michigan Department of Agriculture, Michigan Fruit and Vegetable Report, 1980 from Benton Harbor Fruit Market; and converted to retail weight where necessary using USDA Statistical Bulletin No. 616, Conversion Factors and Weights and Measures, and USDA Livestock and Meat Situation, August, 1978. Processed fruit and vegetable figures represent fresh farm weights that are grown for processing utilization.

b Retail value derived using prices supplied by: U.S. Department of Labor, Bureau of Labor Statistics, Historical Average Retail Food Prices for the North Central Region, 1981; Meijers, Krogers, and Shop Rite supermarkets of Lansing, Michigan; and Giant Supermarket of Midland, Michigan. Prices of various brands, cuts, etc. were averaged for each commodity's retail value. Specific data was not available for the processed fruit and vegetable utilizations. However, the processing potential was found to exist in Michigan. The production value for these are weighted according to their corresponding consumption %'s, so that the Total Production Retail Value can be compared more accurately with the Total Consumption Retail Value. The weighted values are included with The Processed Production Value for the commodity, or included with the Fresh Production Value where processed production was NC.

c Derived using per capita consumption figures from USDA Statistical Bulletin No. 656, Food Consumption, Prices and Expenditures, 1980; and Michigan's 1980 population of 9,258,344 persons.

e Shows the % of the food commodity that we consume which was not produced in Michigan. Computed using the difference between consumption and production (using corresponding Retail Values or Fresh Equivalent Weights) taken as a % of consumption.

f Computed by multiplying the % Import by the Retail Value of Consumption.

g Shows the % of the food commodity that Michigan produces in excess of what Michigan consumes. Computed using the difference between Production and Consumption (using corresponding Retail Values or Fresh Equivalent Weights), taken as a % of production.

h Computed by multiplying the % Export by the Retail Value of Production.

i Derived using acres harvested and yields/acre from Michigan Agricultural Statistics, July 1981; Vegetable and Fruit yields/acre not published supplied by Dr. Zanstra, Michigan State University, Department of Horticulture. Meat, Poultry and Dairy figures represent acres used/needed based on rations of grains, soybean meal, and hay and pasture where applicable; estimates obtained from Michigan State Department of Animal Science. Tree Fruits and Nuts yield/acre derived using total production/total acres of bearing trees.

j Production and consumption weights include weights of edible offals.

k Veal is a by-product of dairy farming, so acreage data is included with dairy.

l Lard is a by-product of hog slaughter, so acreage data is included with pork.

m Derived from the yearly 5 million lb commercial Michigan catch for human consumption estimated by Asa Wright, Michigan DNR, Fisheries Division, using conversion factors from USDA Statistical Bulletin No. 616. Includes fresh, frozen, canned and cured fish in the same proportions as consumption for accurate comparison. Game fish not included.

n Includes: Half and half; light, heavy and sour cream; and yogurt.

o Includes: Whole, skim, flavored milk; lowfat milk drinks; buttermilk; and eggnog.

p Includes: Evaporated, condensed, and dry whole milk; dry buttermilk, whey, and malt; mellorine; and other frozen products.

q Included acres for replacement cows. Accounts for milk used on farm and wasted milk, 1.6% and 2% of total production respectively.

r Production retail weights are grain farm weights, and represent the percentage of corn and soybeans not attributed to Michigan animal or human consumption elsewhere on this chart. For corn, this is 60% of total production. For soybeans this is the meal portion (80%) of 31% of total production. The soy oil portion (18.33%) of this 31% is included in vegetable oil production, although acreage attributed to it is included here in exported soybean meal. Retail values are grain farm values.

s Production data for each grain represents that which is utilized for human consumption. This data does not include oil. Specific data was not available for Michigan. Data was derived using National figures for the percentage of the totals used for human consumption as follows: corn-9.75%; oats-8%; barley-2.4%; Rye-14.7%; soybeans-2%. Sources: National Feed and Grain Association; American Soybean Association; and Corn Refiner's Association, Washington, D.C. Figures exclude grain used in alcohol production.

t Production retail weight and value represent whole grain weight and farm value. Since no corn is processed in Michigan for human consumption, the whole grain corn is exported and all processed products are then imported. Acreage included that attributed to corn oil in vegetable oils.

u Production retail weight and value represent the flour obtainable from 95% of the wheat grain sold by Michigan farmers. The other 5% is assumed to be used for animal feed. Michigan wheat is usually used for pastry and cake flour; the utilization varies depending on the price. If price is low enough, more may be used for animal feed.

v Production retail weight represents the lbs. of oil obtainable from corn and soybeans utilized for processing. Including oil, 10% of total corn grain production is utilized for human consumption. Of this amount, 2.5% is processed as oil. 98% of the total soybean production is processed yielding oil for human consumption and meal for animal feed. Of this amount, 18.33% is oil. Since there are no corn or soybean processing plants in Michigan, all grain for oil processing is exported and all oil products imported. Since we do not "produce" oil, production retail value is given as an average of the farm values of the grain equivalent of the oils. Acreage attributed to the grain equivalent of corn oil production is included in the corn grains for human consumption (see footnote +). Acreage attributed to the grain equivalent of soybean oil production is included in the meats, poultry, dairy, and exported grain categories.

w There was found to be no frozen corn processing in Michigan in 1980.

x Production Retail Weight is fresh weight estimated by Mr. Lenard Wilson, Great Lakes Mushroom Cooperative. Consumption Retail Weight derived from data provided by American Mushroom Institute.

y Included rhubarb, beets, and fresh peas.

z 1979 figures were used for all apple utilization weights since 1980 utilization weights were not available.

aa Includes brine cherries, canned and frozen.

bb A per capita consumption figure was not collected by any known agency. It is assumed that all produce in Michigan is consumed in Michigan through direct marketing. Production and consumption Retail Values were derived using the price received by growers listed in Non Citrus Fruits & Nuts, 1980

Annual Summary, Jan. 1981, USDA Crop Reporting Board.

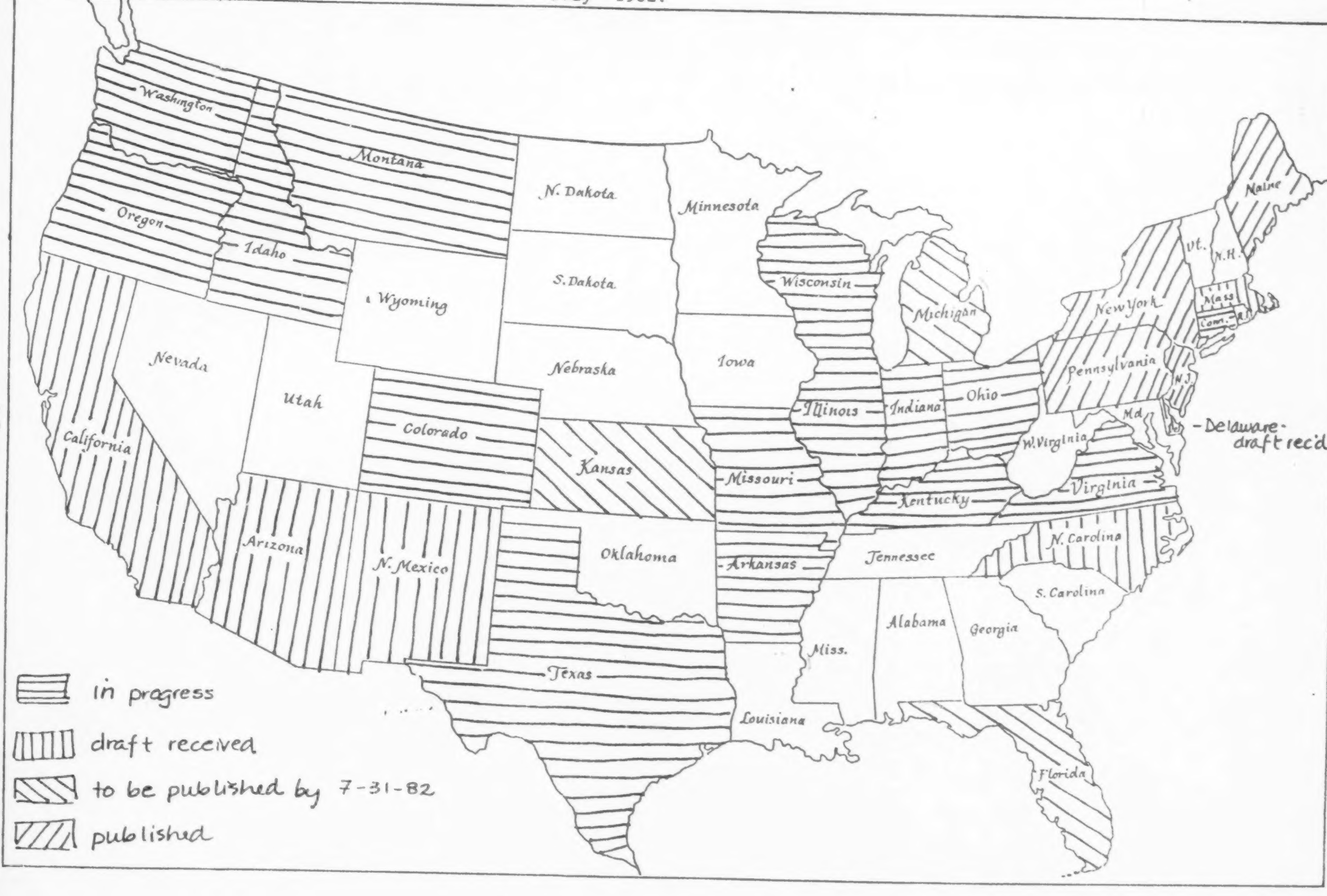
cc Michigan does not produce grapes for raisins. Grapes produced for wine are not included.

dd Represents weight of sugar obtained from sugarbeet production. 1 lb. sugar equals 6.6 lbs sugarbeets, Michigan Department of Agriculture, *Cooks Tour*.

ee Represented by spearmint oil production. Retail weight given in lbs. of oil.

Cornucopia State Food System Studies

July 1982.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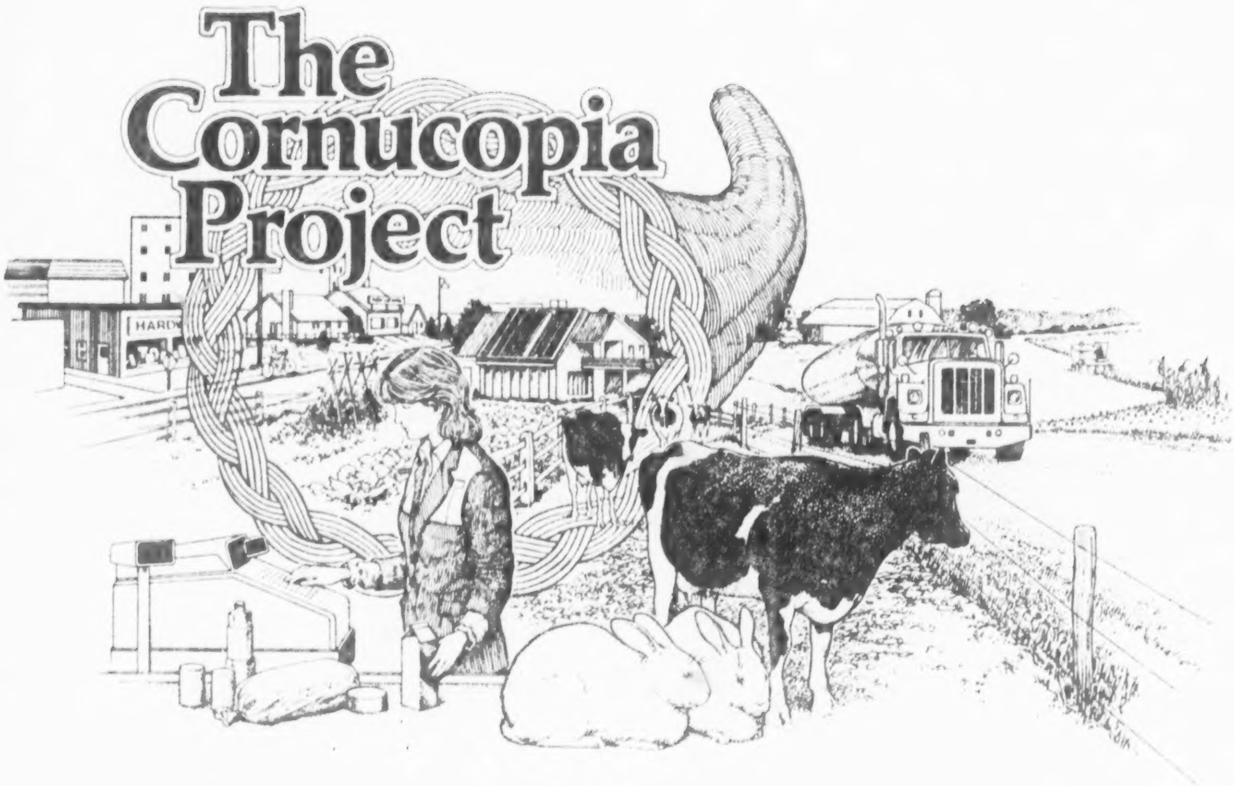
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THE PENNSYLVANIA FOOD SYSTEM: PLANNING FOR REGENERATION

A study of the food system of Pennsylvania by

The Cornucopia Project of Rodale Press

and the research assistance of Ellen Ann Kriss

33 East Minor Street
Emmaus, Pennsylvania 18049
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CONTENTS

Page

Acknowledgments

Introduction 1

Where Do We Stand? 5
    Food Imports 5
    Comparison of Data: 1979 and 1980 10
    Amount of Agricultural Land 11
    Soil Erosion 12
    Farm Numbers 15
    Farm Size 17
    Farm Ownership 17
    Farm Debt 19
    Farm Inputs 21
    Rural Economies 24
    Pesticides 25
    Fertilizers 26
    Food Industry 27
    Food Availability 29

Recommendations: Planning for Regeneration 31
    Major Strategic Themes 31
    Recommendations to Consumers 37
    Recommendations to Farmers 38
    Recommendations to Local Governments 41
    Recommendations to the State 44
    Recommendations to the Food Industry 51
    Recommendations to the Agricultural Research Community 52
    Summary of Recommendations 54

What Has Been Done: An Analysis of Pennsylvania's Laws Relating to the Food Sector 55
    Retaining Farmland and Farmers: How Well Are We Doing? 56
    Overview of Recent Laws: 1976-1982 78

Appendix 84
    Pennsylvania Food System Organizations 85

Notes 90

Charts

    Chart 1 - Amounts and Costs of Vegetables Imported Into Pennsylvania Which Could Be Grown Here: 1980 8
    Chart 2 - Pennsylvania Sheet and Rill Erosion on Cropland: 1977-13
    Chart 3 - Yearly Amount of Topsoil Loss in Pennsylvania 14
    Chart 4 - Number of Farms in Pennsylvania 1900-2000 16
    Chart 5 - Average Size of Farms, Pennsylvania 1940-1980 18
    Chart 6 - Pennsylvania Farm Real Estate Debt: 1960-1980 20
    Chart 7 - Variable Input Costs Per Acre for Grain Corn in Pennsylvania: 1978-1980 22
    Chart 8 - Variable Input Costs Per Acre for Grain Corn in Pennsylvania as Percentages of Total Cost: 1980 23

ACKNOWLEDGMENTS

The Cornucopia Project would like to acknowledge and express its gratitude for all the generous assistance that it received in putting together this updated and expanded report on the Pennsylvania food system. Foremost, our thanks goes to Penrose Hallowell and the Pennsylvania Department of Agriculture for their help with the statistical base of the report and for feedback on last year's pioneering effort. Next, we would like to thank and acknowledge the assistance of the United States Department of Agriculture, the Soil Conservation Service, Pennsylvania Department of Environmental Resources, Pennsylvania Farmers' Association, and the Pennsylvania State University. In particular, special thanks and appreciation for sharing their information and invaluable points of view go to:

Christopher Allen, Pennsylvania Farmers' Association
Barbara Costanzo, Pennsylvania Agricultural Logo Program
Dr. Robert Cunningham, Department of Agronomy, Pennsylvania State University
Wally Evans, Pennsylvania Crop Reporting Service
Dr. Nathan Hartwig, Department of Agronomy, Pennsylvania State University
Robert Heidecker, Soil Conservation Service
John Longenecker, Pennsylvania Department of Agriculture, Bureau of Plant Industry
H. Lou Moore, Department of Agricultural Economics and Rural Sociology, Pennsylvania State University
Afton Schadle, Bureau of Soil and Water Conservation
Brian Schmidt, Soil Conservation Service
Charles Slaton, Pennsylvania Department of Agriculture, Office of Planning and Research
Dr. Stan Weeks, AGWAY Research Farm
Dr. L. L. Wilson, Department of Dairy and Animal Science, Pennsylvania State University
Larry Yeager, Cooperative Extension Agent, Adams County

This updated study of Pennsylvania's food system reflects the combined efforts of the Cornucopia Project staff and the research assistance of Ellen Ann Kriss. The Cornucopia Staff consists of Susan Campbell, Andrea Cesari, Medard Gabel, Carol Gladys, Helene Hollander, Susan Kellam, Ellen Pahl, Jean Polak, and Doreen Xander.

INTRODUCTION

Pennsylvania remains the most productive agricultural state in the Northeast. Its bounty testifies to the high capabilities of its 4.4 million acres of prime farmland and to the commitment and resourcefulness of its 61,000 farmers.[1] It leads the U.S. in the production of mushrooms, cigar-leaf tobacco, sausage, scrapple, quality-graded eggs, pretzels, and potato chips and ranks among the top five states in the production of milk, ice cream and frozen dairy products, cottage cheese, apples, peaches, sweet corn, tart cherries, grapes, grape juice and wines, and maple syrup.[2]

Pennsylvania agriculture generates over $2.7 billion in farm receipts, and supports a $20 billion a year agribusiness economy employing more than 900,000 people. That represents one-fifth of the state's work force.[3]

While acknowledging that Pennsylvania is indeed a productive wonder, The Cornucopia Project last year decided to explore the sustainability of its home state's food system. This led to our first report, The Pennsylvania Food System: Crash or Self-Reliance?, which became the "keystone" of future state studies (in New York, New Jersey, Maine, California, Florida, Arizona, etc.) and which lent valuable insight to our investigation of the national food system, published as Empty Breadbasket? The Coming Challenge to America's Food Supply and What We Can Do About It.

What we first detected in Pennsylvania began to emerge in each state food system we turned to. Productivity itself was not synonymous with sustainability, nor could it guarantee secure and affordable food for all. In some cases, heightened productivity had the reverse effect. As farming on marginal land increased and time-honored conservation practices were abandoned, overproductivity was undermining the very resource upon which our food system is based -- the soil.

But the loss of 50.7 million tons of topsoil to erosion was not the only "frightening fact" we touched upon. We were able to put our finger on the "Achilles' heel," the weak spot of our state food system. We discovered that in spite of our high productivity, we import over 70 percent of the vegetables, fruits, and meat we consume, most of which could be produced here to meet our instate food needs.[4] This dependence on long distance food supplies means vulnerability on many fronts and is a far cry from the sustainable, secure, and affordable food system we want all our citizens to have.

We were so concerned by what we uncovered that one year later we decided to probe further. This updated report explores the extent to which we have become more or less self-reliant. But the study would be incomplete if it stopped there. We realize that the food system is an interconnecting web of many strands. Whereas last year we unwound only a few, this year's report is much longer because it traces and examines more of the components of our state's food system. In this study we look at the complex of problems our farmers are facing, including increased debt load and skyrocketing costs of farm inputs. We explore the implications of farm loss to rural economies, and we look at the health of our food industry. We also analyze some of our state laws to see whether or not they are working to help our farmers and to preserve our farmland.

Can we see signs of regeneration? The study acknowledges a number of positive efforts, especially through recent state programs and laws aimed at alleviating specific problems within the farm community. On the whole, however, the view one year later remains bleak. Consider the following:

* We continue to import 71 percent of our food: 281,000 truckloads of foodstuffs enter the state each year to keep us from going hungry.

- Food transportation costs Pennsylvania consumers over $887,000 each day.

- Food export value was $4 billion less than food imports.

- Each year 37 million pounds of fresh vegetables and fruits are damaged or spoiled in transit to Pennsylvania.

- We are still losing 50.7 million tons of topsoil to erosion -- enough to cover the Pennsylvania Turnpike from one end of the state to the other with 3 feet of topsoil.

- Development of our prime farmland continues to exact a heavy toll on our productivity. An area the size of Pittsburgh is lost every 8 months.

- Last year Pennsylvania lost 1,000 farms; in the last 10 years, 12,000 farms have disappeared.

- Last year Pennsylvania farm real estate debt rose over 15 percent -- to $1.4 billion. (National average increase was 11 percent.)

- It cost Pennsylvania farmers 17.8 percent more to produce one acre of corn for grain between 1979 and 1980, while their gross farm income rose only 2 percent.

- The need for heavy fertilizer application by farmers is highly questionable given a 1981 survey of soil testing labs which showed widely conflicting results on the same Pennsylvania soil.

- In the last 25 years Pennsylvania has lost almost 50 percent of its food processors.

- Accessible, affordable food for Pennsylvania citizens is becoming less available. Many grocery stores have closed and several chains have shut down in urban areas. Need for food assistance in many areas is up 25 percent.

- Our farmland preservation laws need rejuvenation. For example:

    - In fourteen years Act 442 has never saved a single farm.

    - Act 43 needs funding to be effective and to implement a purchase of development rights program.

    - Agricultural zoning under Act 284 continues to face an uphill struggle against challenges to its constitutional validity, and

    - Acts 515 and 319 are only holding actions in preserving our farmland.

Looked at individually, the danger signals may -- to some -- seem faint. In combination, however, they beam a warning that we are on the threshold of a crisis unless steps are taken to reverse the paths we are now on.

But we want to do more than wave red flags. The purpose of The Cornucopia Project is not simply to identify fissures and cracks in the existing order of things and predict a scenario of gloom and doom for our food system. On the contrary, the cornucopia is the image of what we want as a reality for everyone in the state, especially the consumer and the farmer who are intimately a part of the food system.

It is important that the above list of issues be looked at as everyone's problem. The above situation is not just the result of policies by our current leaders, nor is it strictly their responsibility. An impending food crisis touches us all. The consumer, farmer, food industry, agricultural researcher, and our elected representatives in local and state government are all responsible and all have things they can do to help transform our food system. Unfortunately, there are no simple solutions to such a complex problem, but there is no lack of constructive activities that can be undertaken.

To this end, the recommendations section of the report is tailored for all of us. There are things that the consumer can do as well as the farmer, food industry, researcher, and local and state policymaker. We all are in it together and it is together that we need to work to create the kind of food system that will assure our children and our grandchildren an affordable and secure supply of food.

WHERE DO WE STAND?

Last year we reported that Pennsylvania's food system was in trouble. Where do we stand one year later? This section shows where headway has been made, and alerts us to danger signals not reported last year.

First the good news. In one year we have seen our reliance on outside food sources decrease by 2 percent.[5] The number of farms declined less sharply than in preceding years. Some farmers have returned to conservation tillage practices. There has been a 6 percent increase in younger farmers (under age 35).[6] In spite of the drought, there were some increases in production in apples, peaches, pears, and winter wheat. Dairy products continued to be a significant export commodity.

Yet even with these improvements, we are a long way from standing on firm ground. Our reliance on food imports remains high, depleting our state coffers faster than they are being restored through our food exports. Our prime farmland is still disappearing and our farms are decreasing in number. Farm debt has risen considerably and farmers are beginning to put in more to produce their crops than they are taking out in terms of profits. Some farm supply companies and dealerships are closing down, feeling the effects of customer loss. Processors relying on local foodstuffs also cut back when farmers limit production or go out of business.

When one part of the food system starts to limp and falter, it has an unsteadying effect on every other part. In the long run, it is the consumer who will feel the full effect of this insecurity and instability as food prices rise, grocery stores close, and food availability decreases.

Food Imports

Considering Pennsylvania's position as the leader among the Northeast states in agricultural production, it is amazing that we continue to import 71 percent of our food. Although no one may be surprised that we import all of our coffee, tea, oranges, grapefruit, and bananas, it is very surprising how many other foodstuffs we continue to transport into the state which could readily be grown and raised here. While tossing their salads, Pennsylvanians should realize that most of the vegetables come from out-of-state: 99 percent of the lettuce, 87 percent of the celery, 85 percent of the cucumbers, 82 percent of the green peppers, and 68 percent of the fresh tomatoes. Few homemakers may know that many of the ingredients stirred in their beef stew have also traveled long distances before reaching the pot: 77 percent of the beef, 91.5 percent of the onions, 88 percent of the carrots, and 86 percent of the peas. To top their shortcakes, Pennsylvanians import 72 percent of their strawberries.[7] From such diverse states as California, Texas, Florida, and Idaho, 1,700 truckloads of fresh meats, fruits, and vegetables roll into this state each week.[8] In a few cases, we even import the very same foodstuffs we export. Take apples. Although last year we exported over 350 million pounds, we also imported 76 million pounds from as far away as the state of Washington.[9]

Since most of our food has journeyed thousands of miles to reach our plates, that is where 71 percent of our food dollars still go -- outside the state. During 1980, Pennsylvanians spent an average $1,023 per person for food, amounting to a $12 billion total food tab. Of this amount, $8.6 billion went for food produced outside the state, an average of $735 per person leaving Pennsylvania to pay for our daily bread. Although in 1980 we decreased our reliance on outside food sources by 2 percent, we increased the amount of money that left the state to pay for this food by $2 million. We have a long way to go before we even come close to where our food exports reach the dollar value of our food imports. The present difference is $4 billion.[10]

What do all these numbers mean? To the Pennsylvania consumer they dish up some disturbing news.

Our food supply is vulnerable. Because we depend on outside producers for most of our food, our supply is highly uncertain. An oil embargo or energy shortage, a labor dispute, a Med-fly invasion, a drought or crop failure in Florida or California -- any of these could lead to serious shortages. California produces over 40 percent of the nation's fresh fruits and vegetables and close to 50 percent of our processed fruits and vegetables.[11] Any failure along this supply line could have disastrous consequences.

The average U.S. city has under normal conditions a two to three day supply of food.[12] If any disruption in our food supply occurred, perishables would disappear from the stores almost immediately, according to a spokesman for the Pennsylvania Grocers Association.[13] With normal buying patterns, stores over 10,000 square feet might have canned goods for as long as a week; smaller stores without storage space would be empty sooner. If, however, people knew that a shortage was likely, a "food panic" could empty all the stores in less than a day.

Such scenarios are not mere fantasy; we've already had a taste of what they might be like. During the last oil shortage, grocery warehouses were out of almost 20 percent of all food items.[14] Because of inflation and the cost of money, grocery store, warehouse and food processor back-up inventories are even lower than usual. Winter storm warnings often cause local stores to empty out. If something similar happened on a state-wide scale, many of us would soon be hungry, and we wouldn't last long on the surplus supplies of ice cream, mushrooms, and pretzels produced in the state. If a supply disruption

Chart 1

Amounts and Costs of Vegetables Imported Into Pennsylvania Which Could Be Grown Here: 1980

	Amount Consumed in Pennsylvania (1,000 lbs.)	Amount Imported (%)	Money Leaving Pennsylvania (retail)[1] (dollars)	Transportation Cost[2] (dollars)
Broccoli	20,173.9	84.5	13,437,900	712,208
Cabbage	99,682.8	64.3	13,442,730	712,464
Carrots	72,388.7	87.8	17,926,200	950,088
Celery	86,629.1	87.1	54,022,600	2,863,197
Cucumbers	47,468.	85.1	26,000,330	1,378,017
Lettuce	295,488.3	99.3	210,079,240	11,134,199
Onions	121,043.4	91.5	31,238,140	1,165,621
Potatoes	585,043.1	31.4	77,055,550	4,083,944
Snap Beans	15,427.1	93.2	159,370,810	8,446,652
Sweet Potatoes	40,347.8	99.9	17,198,700	91,153
Tomatoes	135,283.8	68.4	18,529,590	982,068

---

[1] Value of imports less the amount that goes to retailer

[2] Based on 5.3 percent of retail value. (USDA, 1980 Handbook of Agricultural Charts, p. 39)

lasted long enough, social order in food-short urban areas could even break down. A serious food shortage in a city could have an effect analogous to the yelling of "fire" in a crowded theatre.

Transportation costs alone account for over $323 million each year, or over $887,000 each day, of our food imports bill. The charge for transporting just the fresh vegetables for our salads, stews, and casseroles came to $35 million last year.[15] Clearly we are paying a higher price for our meals than we have to.

Almost 4 percent of the food that is shipped to Pennsylvania from around the country never reaches our shopping carts because of waste that occurs in transportation, wholesaling, and retailing. Last year, this loss in Pennsylvania came to a staggering $89 million for fresh fruits and vegetables alone. Thirty-seven million pounds of fresh vegetables and fruits were damaged or spoiled in transit to Pennsylvania.[16]

In addition, food that has to travel cross-country must be picked before it is fully ripe, so both its flavor and nutritional value suffer. In short, we end up paying more for food of lesser quality.

Dependence on distant food also means drastic price rises if any problems occur. A study by the U.S. Department of Energy concluded that an energy shortage or reduction of 10 percent in our oil supply would lead to an increase of 55 percent in the price of fresh fruits and vegetables.[17] Our food prices are certain to rise as energy costs go up.

In addition, our state and local economy is weakened. Keeping more of our food dollars here would strengthen Pennsylvania. An economically healthy farming sector increases the strength of the whole region.

Every dollar of output from the livestock sector of farming generates $2.78 of total product throughout the economy on its way to final consumption.

Every dollar of output from the crop sector generates $1.81 of total product.[18] A strong farming sector not only generates income, but provides jobs for non-farm workers.

Comparison of Data: 1979 and 1980

In some ways Pennsylvania agriculture has improved in 1980, given the decline from 73 percent to 71 percent in imported food since last year. Although we still have a long way to go towards increasing our self-reliance, this two percent increase in Pennsylvania-produced foods is a step in the right direction. Unfortunately, this drop in our food imports is countered by a $2 million increase in the total amount paid to out-of-state food suppliers.

Although we can show gross comparisons between last year's and this year's food import data, it is very difficult to analyze changes in Pennsylvania's food production because of certain basic statistical problems.

Like most surveys, Pennsylvania crop production statistics are determined by sampling, based in part on the Census of Agriculture, by the U.S. Department of Commerce, which is updated every five years.[19] When a new census is released, production numbers are updated to reflect new census data. The end result is that data from the most recent production year is not always comparable with updated statistics. The magnitude of this statistical discrepancy is illustrated by various production figures. In 1979, snap bean production for the fresh market was listed as 3,300,000 pounds. The revised figure is 17,000,000 pounds! Winter wheat production for 1979 was originally given as 81.2 million bushels. When the revised figure was released, this total had dropped to 72.8 million bushels.[20] Such discrepancies in statistical reporting make accurate analysis of where our food system is and is heading exceedingly difficult. Without standardized data collection procedures it is possible that we could be heading in the worst possible direction and not know it.

Using the 1980 Crop and Livestock Summary of the Pennsylvania Department of Agriculture, we find that even with last summer's drought, Pennsylvania crop production posted a few increases. Apples climbed 7 percent; pears and peaches were also up. Winter wheat increased by 27 percent, a change attributed to a 6-bushel-per-acre rise in productivity. Dairy products remained a great export commodity, with butter showing the greatest increase. Unfortunately, these increases were matched by large declines in corn grain (down 21 percent -- 20 bushels less per acre) and potatoes (down 24 percent -- 6,000 pounds less per acre). In addition, fresh vegetables showed declines due to last summer's drought. Snap beans, cabbage, and tomatoes, all for fresh market, showed declines in production of 42 percent.[21]

It is encouraging that even under poor weather conditions Pennsylvania agriculture can achieve high levels of productivity. This is further evidence that in-state producers can provide more food to meet our consumption needs.

Amount of Agricultural Land

A more visible sign that our food system remains in trouble is the continued dwindling of the base of our food system -- our agricultural land. Paved over, converted to other land uses, or temporarily removed from productivity and classified as marginal land, our agricultural land (cropland and pastureland) declined by about 1 percent each year between 1967 and 1977. Development and agriculture vie for Pennsylvania's 4.4 million acres of prime farmland, 53 percent of which is currently under cultivation.[22] Level, well drained and requiring few conservation measures, prime farmland has always been favored for development. It is, however, a limited resource. Once we build on our prime farmland, agriculture will be forced to move to marginal, less productive land. Each year 52,000 more acres of cropland are irreversibly lost. An area the size of Pittsburgh is lost to agricultural production every 8 months.[23] This 81-square-mile area could provide Pennsylvania with over 80 percent of our annual fresh, frozen, and canned vegetable consumption.[24]

Not included in these figures are the additional acres that are isolated by leap-frog development, and either eventually removed from production altogether or severely inhibited by non-farm activities surrounding them.[25] This loss is especially severe in the southeastern part of the state, where the urbanizing pressures are most intense, and where the greatest percentage of highly productive soils (Classes I-II) are located.

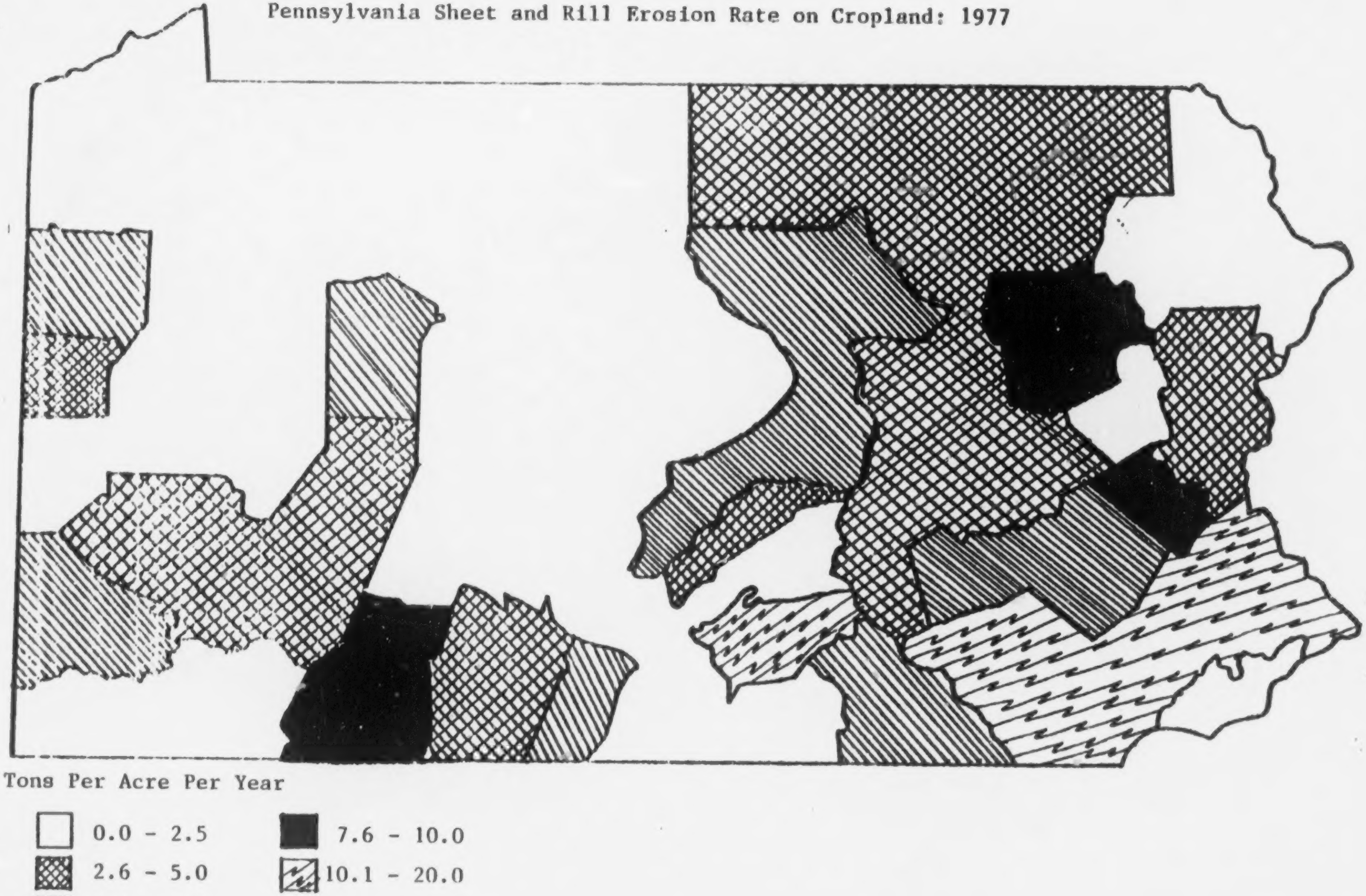
Although additional woodland and pastureland are being converted to cropland, this is occurring primarily on marginal land, with soils in Classes IV and VI, whose productive abilities are limited and whose need for capital outlays for soil preparation and conservation are much greater than those of the soils which are being lost. In spite of this conversion of marginal land to cropland, and a 1.4 percent increase in pastureland, the state still lost 6 percent of its productive agricultural land in the last ten years.[26]

Soil Erosion

"For sale" signs on farmland are not the only indications of our diminishing food base. Perhaps more insidious, because less visible and more cumulative, are the yearly losses of 50.7 million tons of topsoil from cropland, pastureland, and woodland due to sheet and rill erosion. Measured in acres, our topsoil loss continues to exceed 50,000 acres annually. This loss is enough to cover all four lanes of the Pennsylvania Turnpike from one end of

Chart 2

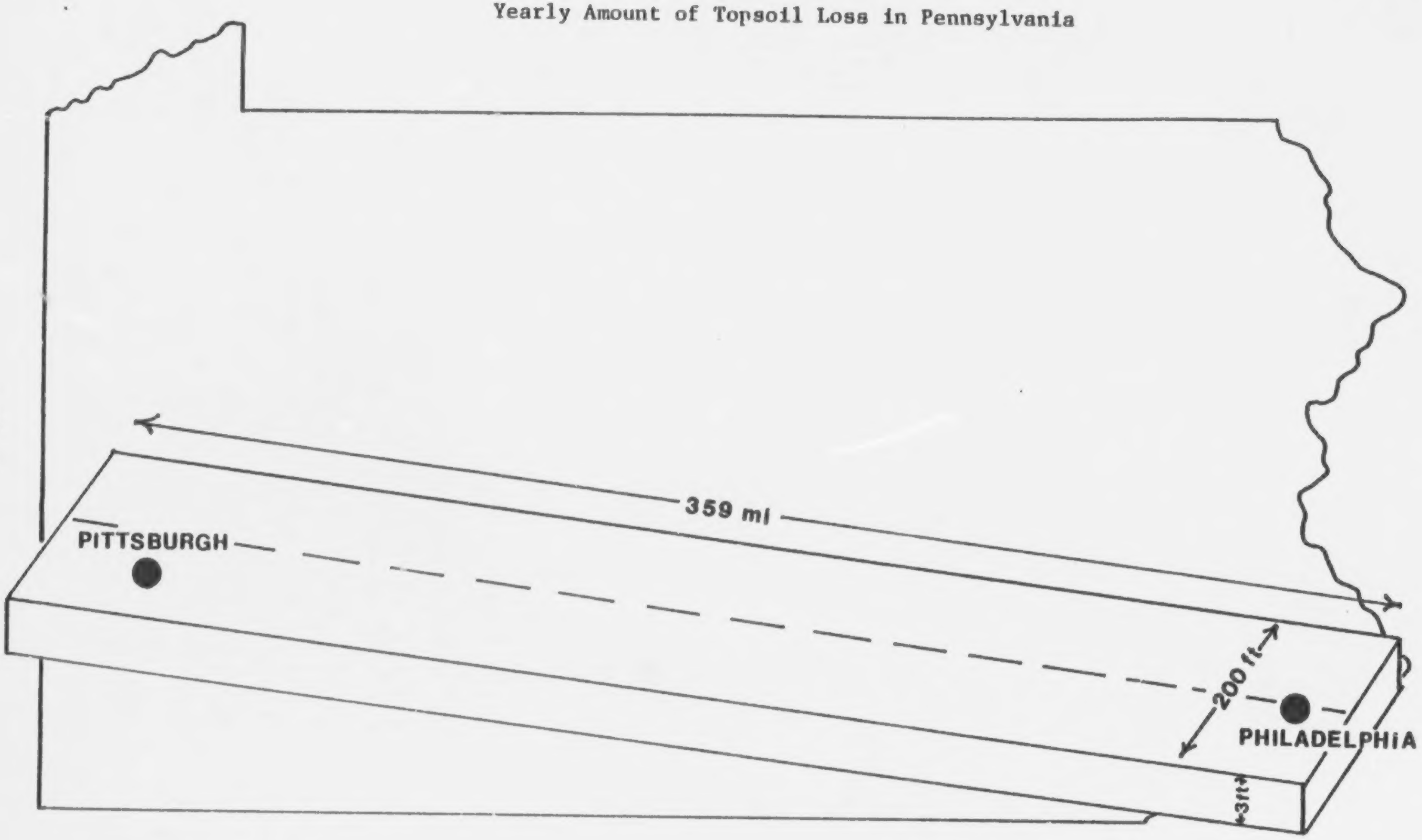
Pennsylvania Sheet and Rill Erosion Rate on Cropland: 1977


Tons Per Acre Per Year
0.0 - 2.5
2.6 - 5.0
5.1 - 7.5
7.6 - 10.0
10.1 - 20.0

Source: "Sheet and Rill Erosion Rate on Cropland by State: 1977," National Resource Inventory, Soil Conservation Service, 1979.

Chart 3

Yearly Amount of Topsoil Loss in Pennsylvania


359 mi
PITTSBURGH
PHILADELPHIA
200 ft
3 ft

The topsoil loss in Pennsylvania is enough to cover the Pennsylvania Turnpike from one end of the state to the other with 3 feet.

the state to the other with 3 feet of topsoil.[27] Chart 2, "Soil Erosion in Pennsylvania," shows that the highest rates of soil erosion are occurring in the southeast region. Here soil is eroding 6-16 tons faster each year than the 3 to 4 ton maximum rate recommended by the Soil Conservation Service.[28]

Excessive erosion exacts heavy costs on our productive abilities. One acre-foot of eroded soil contains about 8,000 pounds of nitrogen and 2,000 pounds of phosphorus. Through erosion alone, we lose over 210 million pounds of nitrogen and 52.8 million pounds of phosphorus annually. This represents over $89 million at current fertilizer mineral costs. Each acre-foot of topsoil also stores 2 inches of available water for crops. With our current topsoil losses, we are washing away over 1.43 billion gallons of water each year,[29] and depleting the soil of its vital moisture retention abilities. Over time these decreases point to lower yields per acre.

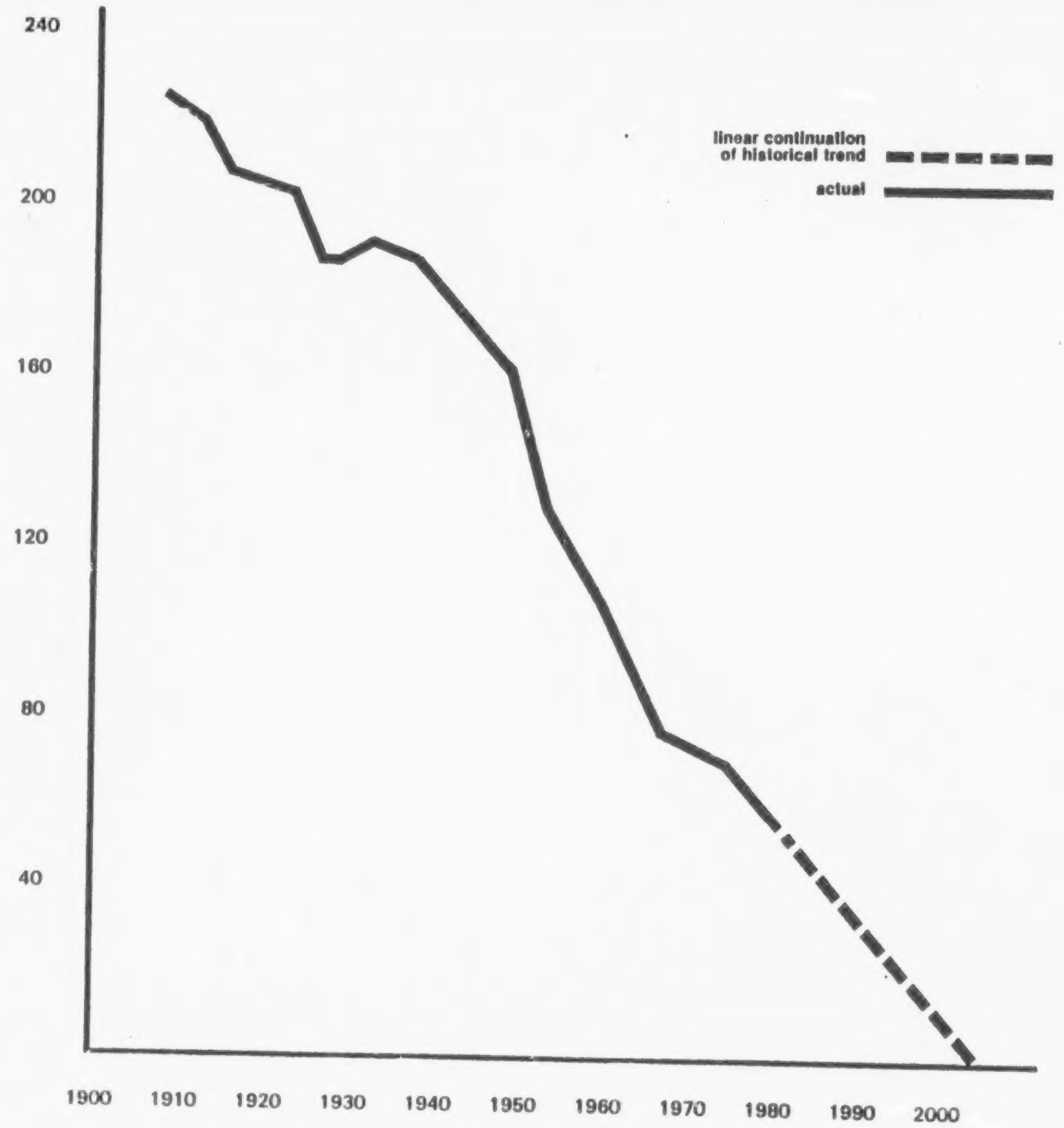
Although soil erosion data is updated only every five years, the most current reports by the Soil Conservation Service indicate an increase in conservation tillage in the last year.[30] Probably because of the 1980 drought, some farmers have opted for planting methods that disturb the soil less than conventional systems, thus enhancing the ability of the soil to hold water, and inhibiting erosion.

Farm Numbers

Related to the productivity of the land are the farms themselves, the structure through which our food is produced. Since 1950, Pennsylvania has lost 61 percent of its farms.[31] Last year alone we lost another 1,000 farms throughout the state, shrinking an already diminishing number to 61,000.[32] Although this loss of farms, at 1.6 percent per year, represents

Chart 4

Number of Farms in Pennsylvania 1900-2000



	number of farms
1940	182,000
1950	159,000
1960	106,000
1970	74,000
1980	62,000
1981	61,000

Source: Pa. Crop Reporting Service

less of a decline than the yearly average of 2.1 percent recorded between 1960 and 1980, it is still too soon to determine if the decrease in farms is leveling off. Even at this decreased rate of loss of farms, we are still heading toward the prospect of no farms in forty or fifty years.

Although the trend of a decreasing number of farms has not been reversed, there is at least one encouraging sign. The number of farmers under thirty-five has increased dramatically between 1974 and 1978,[33] possibly due to an increase in younger people entering farming on a part-time basis.

Farm Size

Strongly linked with the decline in farm numbers is the steady increase in farm size. Last year, the average farm expanded one acre, reaching 146 acres. Although a 1-acre increment may seem small, over the last thirty years, such changes have added up to an increase in farm size of over 62 percent.[34]

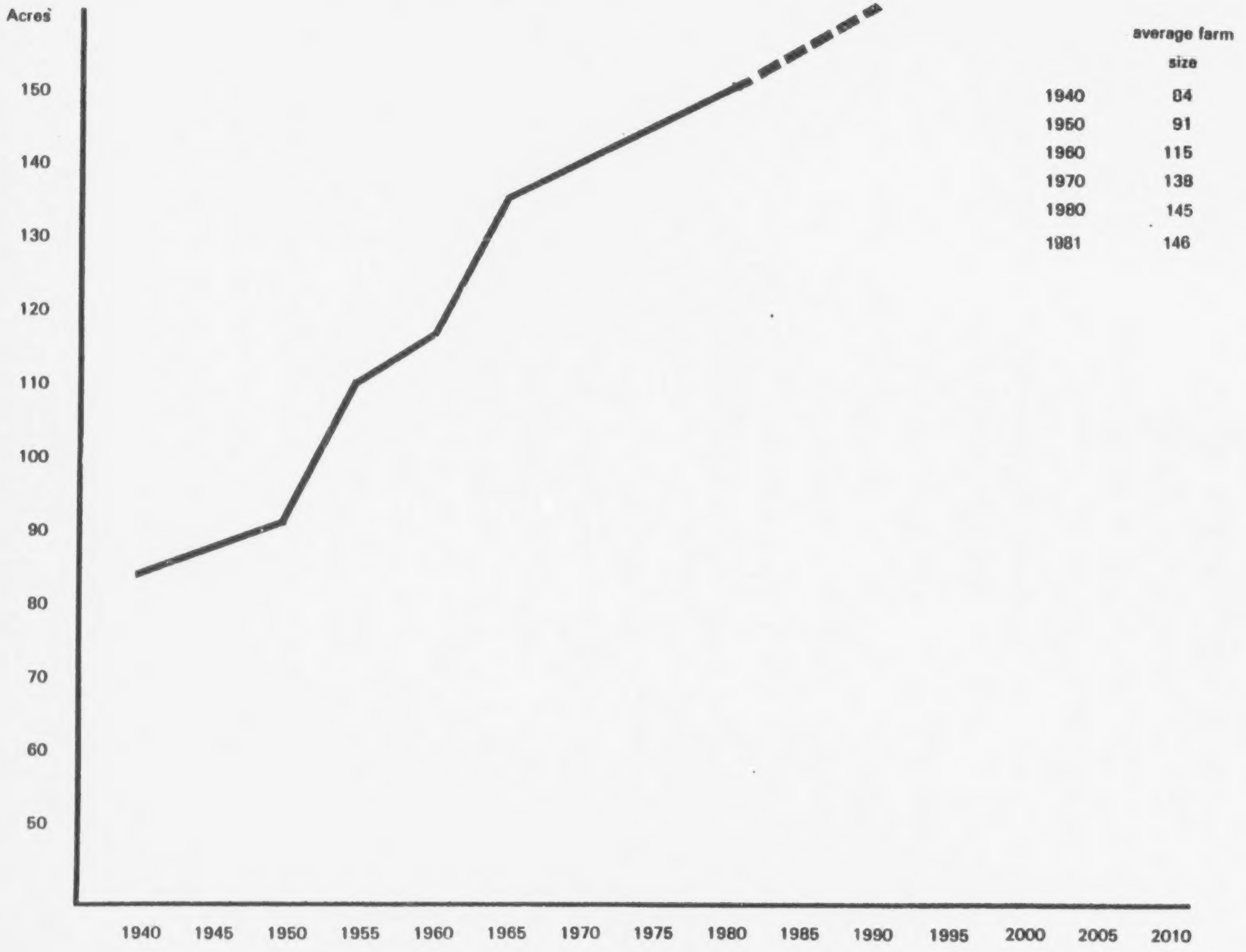
Pennsylvania farmers need to assess very carefully their present and future farming needs before turning to increased farm size as the only means of increasing farm productivity or income. Beyond a certain point -- yet to be determined for Pennsylvania farmers -- increased farm size is no guarantee of economic survival.

Farm Ownership

As the number of farms decreases, and as these farms become larger, control of Pennsylvania's farms is concentrated in the hands of fewer and fewer farm owners. As fewer people control the farms on which our food is produced, Pennsylvania's consumers become more vulnerable to decisions about the kinds of foods that will be available and the prices that will be charged.

Chart 5

Average Size of Farms, Pennsylvania 1940-1980



	average farm size
1940	84
1950	91
1960	115
1970	138
1980	145
1981	146

Source: Pa. Crop Reporting Service

Nationally, over half of all our agricultural land has changed hands since 1960. Each year between 2 and 3 percent of all farmland has a new owner.[35] Frequent change in ownership may indicate a decline in family-owned farms. High turnover hinders the thorough understanding and commitment to the land with which a farmer has been entrusted. Such commitment and understanding is necessary if tomorrow's land base is going to be as productive as today's.

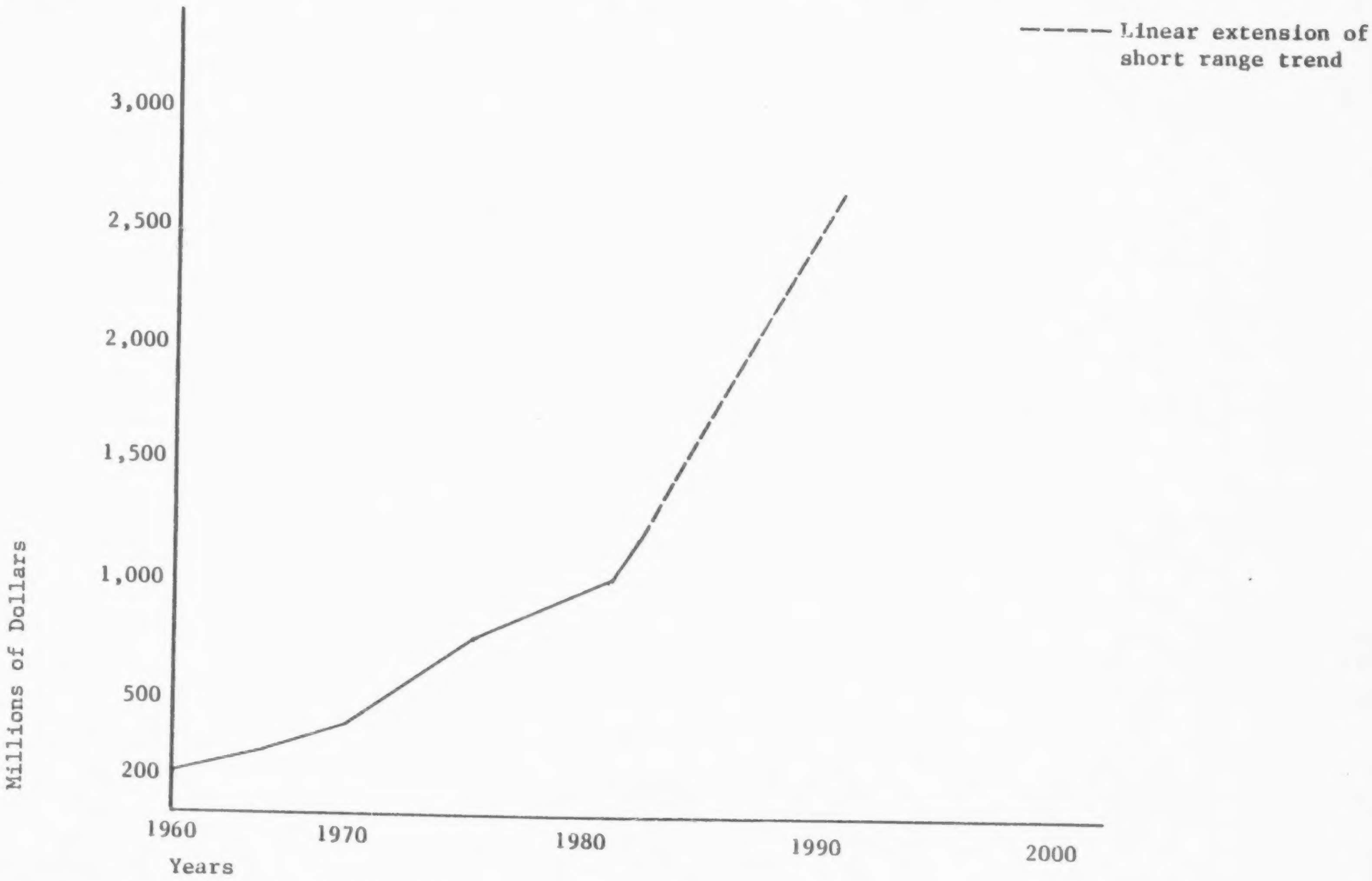
Farm Debt

A major reason for the high turnover of farmland ownership and loss of farmland and farms is the debt load which farmers carry, brought on by a combination of high capital requirements, increasingly higher interest rates, and low prices paid for farm products. Nationally, farm real estate debt rose 11 percent from 1980 to 1981.[36] Meanwhile, for the same period, Pennsylvania farm real estate debt rose over 14 percent to $1.4 billion. This is an average of about $23,000 per farmer.[37] A glance at Chart 6, "Pennsylvania Farm Real Estate Debt," will show that if long range trends continue, farmer real estate debt will be $2 billion by the year 2000.

A young person entering farming today may pay $2,000 to $3,000 per acre for land. At today's high interest rates, growing corn for $2.75 a bushel won't even meet the interest payments on this land.[38] Although those who have purchased farms within the last five to ten years may be more vulnerable to going out of business than those not as burdened with high interest rates, farm debt plagues the whole farming sector. In Pennsylvania, owners of farms as small as 40 acres and as large as 900 acres have been forced to sell out.[39] Right now there are a number of lending agencies that are unwilling to finance another year's production.[40]

Chart 6

Pennsylvania Farm Real Estate Debt: 1960-1980*



*Non real estate farm debt is not included.

Source: USDA, Ag Stats 1980 (Washington Government Printing Office, 1980), p. 477, Economic Indicators of the Farm Sector, SB 678, p. 190.

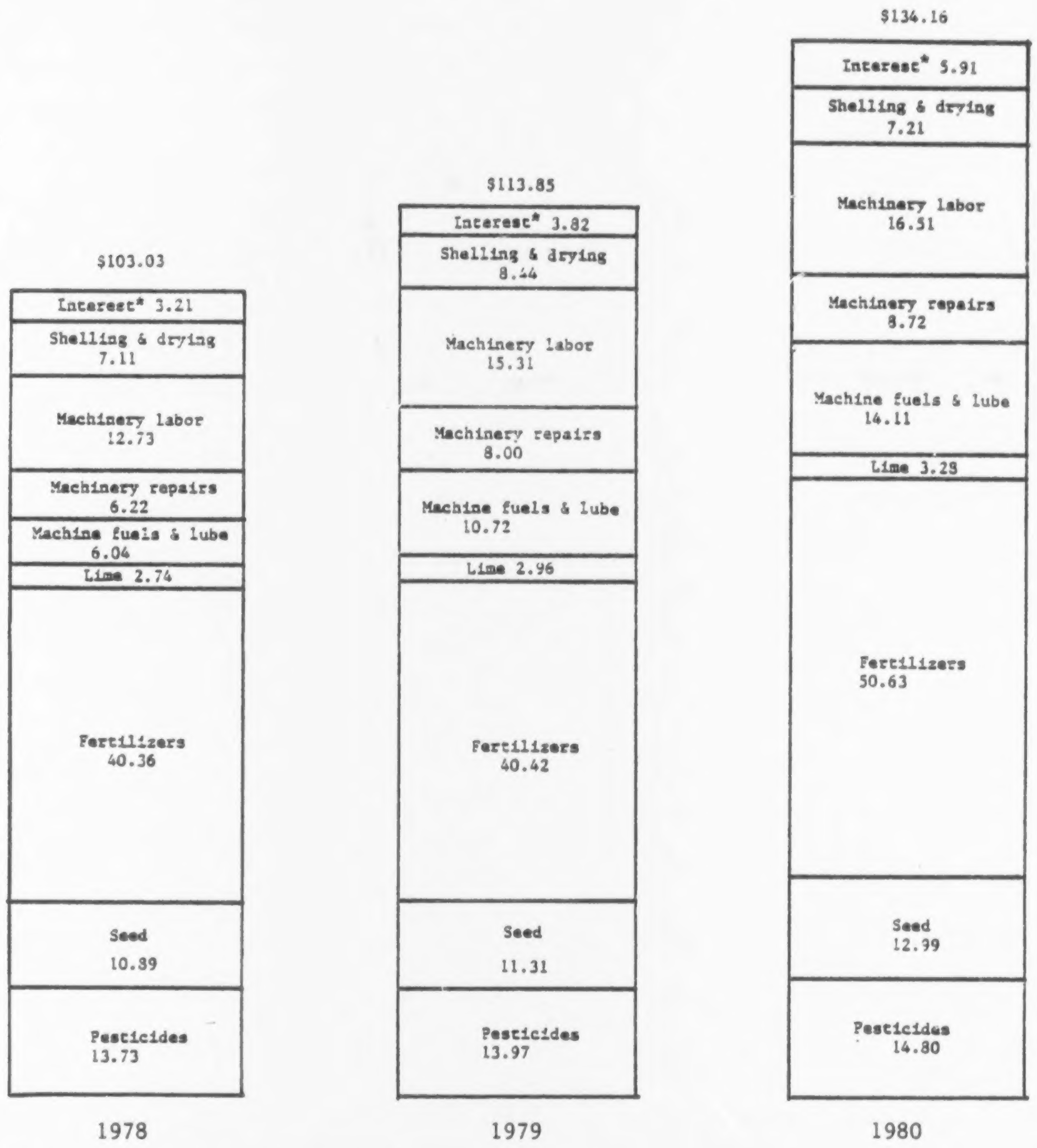
To help offset their indebtedness and to make ends meet, 57 percent of the farm operators in Pennsylvania are finding employment off their farm. For 38 percent of these, off-farm employment has become their primary source of income as they work 200 or more days away from their farm operation.[41] As a consequence, production on these farms is limited by the number of hours the farmer has available to work on the farm. Those who cannot get financial assistance for their operation, or those who do not want or cannot find employment elsewhere, are forced to sell out to larger operators or to developers who will pay as much as $5,000 an acre for flat, well-drained farmland.

Farm Inputs

Accelerating interest rates are only one reason for the increased debt load with which farmers are burdened. Another is the lessening margin of profit, the result of lowered prices received for some farm output, decreased yields for certain commodities, and higher costs of production. The variable costs of farm inputs have skyrocketed over the past three years. Take the production of corn for grain as an example. Chart #7, "Variable Input Costs: Corn For Grain," shows the leap in expenses between 1978 and 1980. Seed and lime costs increased over 19 percent each. Fertilizers jumped over 25 percent. Machinery costs were the most dramatic. Machine fuel and lube soared 134 percent, and machinery repair costs increased over 40 percent. Machinery labor costs rose nearly 30 percent. Not including fixed expenses such as land mortgage, taxes, depreciation, interest, and insurance, it cost Pennsylvania farmers 30.2 percent more to produce one acre of corn for grain in 1980 than in 1978, and 17.8 percent more between 1979 and 1980.[42] On the other hand, gross income for one acre of corn for grain rose only 11.5 percent between 1978

Chart 7

Variable Input Costs Per Acre for Grain Corn in Pennsylvania: 1978-1980

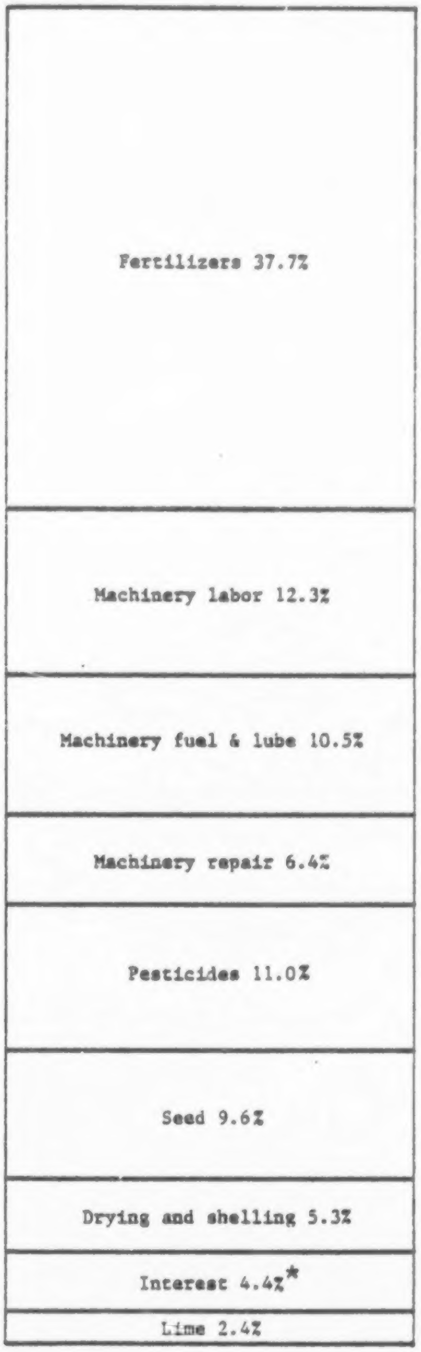


*Interest on operating capital

Source: National Economics Division, Economic Research Service, "Variable Input Costs: Corn for Grain" (Stillwater, OK: Oklahoma State University), unpublished, 1978-1980.

Chart 8

Variable Input Costs Per Acre for Grain Corn in Pennsylvania as Percentages of Total Cost: 1980



*Interest on operating capital

Source: National Economics Division, Economic Research Service, "Variable Input Costs: Corn for Grain" (Stillwater, OK: Oklahoma State University), unpublished, 1978-1980.

and 1980, and only 2 percent between 1979 and 1980.[43] Clearly farmers are beginning to put more in than they're getting out. And, unfortunately for the farmers, they are not always able to pass these costs on to the consumer.

Rural Economies

The loss of agricultural land, farms, and farmers has spin-offs on other businesses in the rural economy. Extensive economic activity is required to support primary agriculture and to process, transport, and sell the output of the farming sector.[44] In parts of the Midwest, farming communities are beginning to discover that they are not recession-proof. When farmers are attacked by high interest rates and soaring production costs, the entire community hurts.[45] Industries which provide farmers with their seed, fertilizer, feed, and equipment, as well as processing facilities, are affected when farms in the area go out of business. Among some farm supply companies, dealerships have dropped by as much as 20 percent over the last five years.[46] Dealers see a direct correlation between the decline of farmers and the discontinuation of dealerships.[47] High capital costs and soaring interest rates force farmers to buy less costly equipment, and use it longer before buying replacements, resulting in a slow turnover of high price tag equipment.

Processing operations -- dairies, broiler processors, canners, and packers -- also suffer when farms go out of business. Processors can be hurt when farmers cut back on their production and start to work off the farm. Without a steady, vigorous supply of agricultural products, these businesses could be forced to cut back production, or go out of business entirely. When farms and their support businesses fold, rural communities can be left with increased unemployment, sharp decreases in the sales of local businesses, and a diminished commercial tax base.

Pesticides

Pesticide costs per acre for corn rose almost 8 percent between 1978 and 1980. In the United States 846 million pounds of pesticides are applied annually,[48] about 3.7 pounds of active ingredient per person. In light of the national average, it would seem that Pennsylvania, at .5 pounds of active ingredient per person, is fairly conservative.[49] However, since the national figure is inflated by the huge quantities of pesticides used for cotton and peanuts, which are not grown in this state, Pennsylvania's pesticide rate is not as conservative as it seems at first. Thus far, only one study has been done to determine the extent of pesticide use on Pennsylvania's crops. However, this study was based on responses from only 2 percent of the farmers in Pennsylvania.[50] It is difficult to determine accurate statewide pesticide use, or abuse, from such a limited sampling. Unfortunately at the moment, this study is the best information available. The state simply does not collect pesticide information.

Pesticides that are carelessly applied can drift far from their points of application, killing crops and beneficial insect populations downwind. Pesticides washed off by heavy rains can find their way into our water supplies, and some pesticide residues remain on the fruits and vegetables we buy in the grocery store.[51] Further research is needed to determine the health and economic impacts of pesticides in Pennsylvania.

Fertilizers

In 1980, farmers spent $50 per acre for fertilizers for their corn-for-grain crops, an increase of 25 percent from 1979. Increased fertilizer application can lead to increased production, but many farmers routinely apply far more fertilizer than the soil needs or the crops can use. In a 1981 survey of soil testing labs, many labs gave conflicting results even though they were all given the same Pennsylvania soil to analyze. Some labs reported inadequate fertilizer levels and recommended large fertilizer dosages while others showed adequate levels of phosphorus, potassium, or nitrogen for the same fields, but still recommended increased fertilizer applications. Residual levels of potassium, phosphorus, and nitrogen in soils are frequently overlooked or ignored, leading to additional applications of fertilizers that increase the farmers' production costs, but give no appreciable increase in yields.[52] In many cases farmers may be increasing their production costs unnecessarily.

Fertilizers are the most energy intensive agricultural input. In Pennsylvania they account for about 35 percent of all the energy used in farming.[53] Even with a 1.5 percent decrease in fertilizer use from last year, our current 653,376 tons of application may be too high.[54] Over-application of fertilizer results in wasted energy as well as wasted money.

A high dependence on chemical fertilizers means dependence on a diminishing mineral base, resulting in increased imports of phosphate, anhydrous ammonia (for nitrogen), and potash (for potassium). U.S. supplies of phosphate are expected to dwindle rapidly after the year 2000. At the same time, 90 percent of our potash will be imported. Anhydrous ammonia is made from a process that uses natural gas, another limited and expensive resource.[55]

Already Pennsylvania farmers use 94 percent of their collectable manure -- 686,233 tons dry weight -- for fertilizer. Only about 25,126 tons need to be disposed of.[56] With rising chemical fertilizer costs, this small surplus won't begin to meet our fertilizer needs.

Food Industry

Although state, county, and local governments are beginning to take a closer look at problems with the production sector of our food system, it is also important to look at other components, including processing. Vital to our state economy and to meeting local food demand are Pennsylvania's 1,529 food processing companies, which package, can, freeze, dry, and refine a wide variety of the foodstuffs we consume.[57] These foods range from vegetables, grains, fruits, meats, fish, and dairy products to candy, potato chips, chewing gum, ketchup, soft drinks, wine, and coffee. Of special interest is that 95.8 percent of our food processors are headquartered in-state.[58]

Unfortunately, between 1954 and 1978, the number of food manufacturers declined by 48 percent.[59] Mirroring the nationwide trend, many of Pennsylvania's smaller plants were absorbed into larger companies or closed down. Plant number declines were most pronounced for dairy products, poultry and eggs, canned fruits and vegetables, pickles, sauces and salad dressings, bakery goods, and beverages. Even though milk production is one of Pennsylvania agriculture's strong points, the number of milk dealers has declined by 81 percent in the last 30 years. In the same time period, the number of producer-dealers -- farmers who process and retail milk from their own herds -- has dropped 91 percent. Corresponding to this decrease in food processors was a 17 percent decline in employment among production workers from 1954 to 1977.[61]

of these were conventional supermarkets, stores under 30,000 total square feet,[66] which have typically serviced local communities. At the same time, there has been a 54.2 percent increase in "super-stores," those with over 30,000 square feet. These "super-stores" are not a replacement for the food needs of the inner-city elderly and lower income residents who cannot afford to travel great distances to these usually suburban mammoth food stores.

Since late in 1981, A&P has closed 50 stores in Pennsylvania. Finally in March of 1982, the decision was made to eliminate the Pennsylvania regional headquarters, and to service the remaining 41 Pennsylvania stores from other divisions.[67] A&P's closings are by no means an isolated case. Increased competition, higher operating costs, and a slow economy have taken their toll on most grocery store operators, forcing two Philadelphia chains to terminate since 1975.[68] The decline in grocery stores is reflected in the 25 percent drop in the number of paid grocery store employees between 1967 and 1979.[69]

For some people in Pennsylvania food is not easily accessible, and for a growing number of people, food is simply unaffordable. High unemployment, rising food costs, and budget cuts in federal food assistance programs are putting an adequate diet beyond the means of many Pennsylvanians. Churches that formerly had one or two people per week requesting food are now feeding 20 people a week.[70] In the Lehigh Valley, both government programs (Food Stamp Program, Women Infants and Children Feeding Program) and private sector groups (Meals on Wheels, Salvation Army, church soup kitchens and food banks) report increases of up to 25 percent in the number of people requesting food assistance in the last year.[71] Currently, there are no statewide statistics on all the food assistance programs available in Pennsylvania. Not only do we not know how many Pennsylvanians are currently receiving some form of food assistance, but there is no information on how many people require it

More than 80 percent of our meat, dairy products, and bakery products are brought to us by truck. Transportation accounts for 5.3 percent of our food expenditures.[62] Obviously, transportation costs are higher for foods shipped to us from processors outside of Pennsylvania who are several thousand miles away.

Farmers who are able to sell their produce to in-state processors often receive a better price for their goods because transportation costs are lower. Pennsylvania-based processors may also be more inclined to deal with smaller in-state farmers. Large national or regional multi-product processors tend to buy wherever they can get the volume and quantity to support their nationwide or regionwide marketing programs.[63] Instead of contracting with local farmers to produce vegetables for their processing operations, some large in-state processors in Pennsylvania procure 60 to 70 percent of their produce from growers in California, Iowa, Michigan, North Carolina, Indiana, Illinois, and Ohio.[64] Although it is understandable that processors go out of state to obtain foodstuffs that cannot be grown here, such as chick-peas, pigeon peas, and dried beans, there is no reason why Pennsylvania soils cannot supply more onions, cucumbers, apples, and tomatoes and other locally grown foods to local processors.[65]

Food Availability

Most consumers in Pennsylvania come in closest contact with their food at the end of the production, processing, and distribution chain -- at their grocery store. Keenly felt by many inner-city and suburban residents in Pennsylvania are the closings of local supermarkets and the absence of nearby grocery stores to conveniently and economically meet their food needs. Nationwide, 4.2 percent of all the supermarkets closed in 1980. Ninety percent but are not receiving it. Clearly, accessible, affordable food is not yet available to all the people of Pennsylvania.

RECOMMENDATIONS: PLANNING FOR REGENERATION

Developing a secure, sustainable, and affordable food supply is the major goal of The Cornucopia Project. To attain this goal will require a great deal of effort on many levels -- from consumer and farmer to industry and government. The Cornucopia Project has developed a set of recommendations for Pennsylvania that could help create a more vibrant state economy, a more secure and affordable supply of food, and an environment that is sustainable into the 21st century.

The major strategic themes running through all of the recommendations are outlined below. These four points are the most important and deserve the highest priority. They are followed by a series of more explicit recommendations aimed at the various participants in our food system -- namely, the consumer, who is the foundation of the entire food system and who has the most power to change it; the farmer, who produces our food; the food industry, which processes and distributes our food, and which has the power to improve our food system in relatively short order; the cities, which will be hit hardest by any food crisis; the state, which has the power to do many of the things necessary to make Pennsylvania's food supply secure; and the research community, which can improve the system we now have.

MAJOR STRATEGIC THEMES

I. Pennsylvania Should Grow More Food for In-State Consumption

Growing more food in-state will help the Pennsylvania economy by keeping more food dollars in local areas, by reducing the $304 million food transportation bill, and by creating jobs and increasing state revenues. Food will also be fresher and taste better, not having been subjected to early harvesting and long-distance transportation. Far less energy will be consumed in getting food from the field to the table. To produce all our food needs (with the exception of those items which cannot be grown here due to climate, e.g., coffee, tea, cocoa, citrus fruits) would require 15,835,500 acres.[1] In 1977 (most recent data available), we had 5,661,000 acres of cropland available with an additional 1.4 million acres of land having medium to high potential for conversion to cropland.[2] This total is 7,091,000 acres. To produce all our food needs with the additional exception of beef, we would need 8,565,658 acres. Subtracting pastureland for dairy cows from this gives a total of 6,008,751 acres of cropland.[3] As this figure points out, Pennsylvania could be largely self-reliant in almost everything except beef. But we cannot be completely self-sufficient with current consumption patterns and it is highly questionable if we even should be, but there are numerous ways to increase Pennsylvania's food self-reliance and the viability of the state economy.

For example, if Pennsylvania increased its animal production and meat processing to meet 100 percent of our meat consumption needs, this could create over 122,000 additional jobs through increased processing plants, feedlot operations etc.,[4] and would provide over $196 million worth of fertilizer minerals -- containing 4.2 times the nitrogen, 1.7 times the phosphorus and 2.4 times the potash that was used in 1980 by Pennsylvania farmers.[5] By processing this 4.44 million tons of manure in anaerobic digesters we would also be capable of generating 42.6 billion cubic feet of methane worth nearly $191.7 billion.[6] The residues from this methane production would have all the fertilizer content that the original manure had.

If Pennsylvania simply increased its chicken (broiler) production from the current 321 million pounds to the 593 million pounds which its residents consume, it would add nearly $300 million to the state's economy[7] and provide 3,617 more jobs.[8]

Given our land limitations, and our current consumption patterns with their heavy reliance of beef, it is not currently feasible to produce all of our meat in-state, but as these figures clearly demonstrate, there is a very large potential for increasing meat production and many advantages in doing so.

Another possible way to increase Pennsylvania's self-reliance and the vitality of the state's economy is to boost our production of vegetables and fruits to meet all our needs. Self-reliance in vegetables would not necessarily require large changes in our diet. With Pennsylvania's climate, soils and growing season, many more fruits and vegetables can be grown. The total acreage needed to produce all fresh fruit and vegetables and vegetables for freezing and canning comes to 389,840 acres, just a little over 5 percent of our current total cropland.[9] All our vegetables could be grown on land that is now producing hay. Just a little over half of that acreage (53% of Class I, II, and III land designated "occasionally improved hayland") would provide for all the state's vegetable needs.[10]

In addition, the state has over 300 acres of greenhouses which could satisfy part of our out-of-season vegetable needs.[11] Twenty-eight percent of the vegetables and 38 percent of the fruits we consume are frozen or canned. We could easily grow and preserve this amount in-state. If we put more emphasis on eating seasonally and regionally, on producing more food in greenhouses, on growing a wider range of crops suited to cold weather, and on producing the same amounts of fruits and vegetables for preservation that we now consume, we could meet 100 percent of our vegetable and fruit needs from Pennsylvania-grown crops.

Pennsylvania would have much to gain from increased vegetable production. Merely increasing cabbage production by 180 percent (to a total of 5,220 acres) to meet all our consumption needs would generate $11.5 million worth of economic activity in the state.[12]

Home gardens can provide a substantial portion of our vegetable needs. Already almost 50 percent of our households have gardens.[13] Average cost of inputs is low -- $25 covers seed, soil preparation materials, lime, manure, mulch, and water -- and return on investment is high. Last year the average-size garden in Pennsylvania yielded about 492 pounds of produce worth $414. The return on the investment was 1656 percent including labor. This is for approximately five hours of work or less per week.[14] If every one of the 4.2 million households in Pennsylvania had a garden which yielded 712 pounds of produce (a feasible goal given intensive gardening techniques), we could meet all of our fresh, frozen, and canned vegetable needs from just our gardens. This is unlikely to happen, but our current gardens already have the potential to grow enough food to meet 35 percent of the state's total vegetable needs.[15]

II. Pennsylvania Should Encourage Local Markets

The benefits of buying locally as much food as possible are numerous and include lower transportation costs, less energy consumed in transportation, less waste due to long distance hauling, and potentially more nutritious produce since vitamin and mineral content decreases with time following harvest. Local farmers benefit as much as consumers because they have a market for their produce which will pay more than an interstate broker. U.S.

Department of Agriculture studies of direct markets in Colorado showed that local farmers received 44 percent higher gross returns if they sold locally than if they marketed through wholesale channels. Consumers received an average 28 percent discount compared to supermarket prices.[16] A study in New York City showed price savings ranging from 7 to 35 percent.[17]

One quick and inexpensive way to augment Pennsylvania's existing marketing program would be to conduct and publish a survey of all food producers and large-volume food buyers -- such as grocery stores, hospitals, industry, and restaurants --to determine what farmers would produce, given a market, and what institutions would purchase, in terms of commodity and quantity. Farmers would know what the market was and buyers would know where to obtain fresh, wholesome produce. If such a survey were conducted on a local level for each of Pennsylvania's ten planning regions, either by the state's Department of Agriculture or local authorities, both producers and consumers would benefit.

III. Pennsylvania Should Maintain Its Farm Resource Base

Soil is the foundation of one of Pennsylvania's largest industries.[18] And so it is imperative that attention be given to the tons of soil being washed away irretrievably into our streams, rivers, and lakes. Once the soil is lost, there is little hope of producing food for anyone, let alone of attempting to make our state more self-reliant.

Preservation of Pennsylvania farmland can no longer be a debatable issue. We need all our prime farmland. We can no longer afford uncontrolled, rampant development on our best lands.

Farmers are critical components of our food system. Efforts must continue to make their livelihood profitable, sustainable, and accessible. People who wish to farm must have the financial and technical support to do so. Farm support services must be maintained to provide essential materials and services to the farm community. Farm equipment dealers, seed and fertilizer salespeople, feed mills, and agricultural credit associations as well as the cooperative extension service supply some of the necessary inputs to the farm sector. The strength of Pennsylvania's farm resource base is dependent upon these component parts. Support services are no less important than the other elements.

IV. Pennsylvania Should Continue to Expand Consumer Education and Awareness

Informed consumers can actively participate in working towards sustainability and regeneration in the food system. Consumer demand can effectively influence the Pennsylvania food industry more than any regulatory or legislative action. Individuals can also have a tremendous impact on local grocery stores and their purchasing policies simply by asking for locally-grown, locally-processed foods. Increased consumer awareness and action may be the single most effective force in changing the direction of Pennsylvania's food system.

The following set of recommendations offers more detailed analyses of what consumers, farmers, the state and local governments, the food industry, and our research community can do to regenerate Pennsylvania's food system.

RECOMMENDATIONS TO CONSUMERS

1. Become more active in your food system. Increase your awareness of what foods are locally produced and which are transported in from other areas of the country. Know the nutritional quality of the food you consume. Share information with friends, neighbors, and supermarket and grocery store personnel.

2. Form a local Cornucopia Project consisting of people who want to work at changing some aspect of their food system. Possible activities include establishing home and community gardens, bartering, cooperative food buying, storing and preserving, setting up food banks, and gleaning from harvested fields.[19]

3. Purchase locally-grown fruits and vegetables in season, taking advantage of their peak nutritional value and decreased cost. You can also process these foods and store them for cold weather months to eliminate higher commercially processed and packaged food prices.

4. Support your local farmers by purchasing food directly from growers, thereby increasing their needed financial support while enjoying fresh, nutritious foods at reasonable prices. Start food co-ops and for additional savings, contract with farmers in the region to produce some of your food.

5. Change your eating habits to improve and maintain your health by consuming less fat, salt, sugar, and cholesterol while increasing fiber and vegetable protein intake.

6. Start a home garden to produce more of your own fruits and vegetables. Community gardens provide a greater selection of produce when the harvest is shared with cooperating gardeners. They offer access to land for those (especially urban residents) who might otherwise be unable to garden.

7. Extend your growing season by building solar grow-frames and/or utilizing container gardening.[20]

8. Starting a land trust which could purchase critical agricultural properties as they come on the market, resell them with deed restrictions to new farm owners, or transfer them to other appropriate trusts or to the city, county, or state at some future time. A land trust is a non-profit corporation which is able to own real property or interest in real property. It is one way to offer permanent protection to selective farming areas within local communities.

RECOMMENDATIONS TO FARMERS

I. Farmland Preservation

1. Take advantage of existing laws. Farmers should become better informed about specific state and local laws which can benefit them. These include: current use value assessment (Acts 319 and 515), forming agricultural areas and receiving eligibility for purchase of development rights (Act 43), obtaining preferential valuation of agricultural land for inheritance taxes (Act 207), and receiving exemptions from capital stock tax for family farm corporations (Act 179).[21]

2. Learn about the opportunity to donate agricultural conservation easements to the American Farmland Trust through the Pennsylvania Farmers Association. With such a donation farmers now can receive an income tax deduction equal to the value of the easements under a 1980 revision of the Internal Revenue Code, P.L. 96-541. The recent donation of agricultural conservation easements in Snyder County is to be lauded as a step in the right direction.

3. Learn about the diversity of technical assistance and services available to farmers through local conservancies and land trusts, which can show them the best options for the future use of their land, including areas which are not essential to farm production. This kind of planning service would help farmers realize certain economic benefits while still maintaining and preserving their farm operation.

4. Preserve farmland by markedly decreasing soil erosion. Your local soil conservation district will provide you with assistance in developing or updating a soil and water conservation management program, suggesting strategies to build the soil and reduce the need for increasingly costly fertilizer inputs.

5. Reduce soil losses through combinations of structural and management practices, such as conservation tillage, cropland terraces and diversions, contour farming, the use of crop residues, winter cover crops, and hedges.[22]

6. Take land that is severely eroding out of production.

7. Use marginal lands for grazing livestock instead of crop production.

8. Have soils tested accurately to determine the nutrient value of the soil and its fertilizer needs in order to prevent overuse of costly, energy-intensive fertilizers. Beware of inaccurate soil testing services.

II. Farm Inputs/Resources

1. Diversify production with selected combinations or rotations of crops or an interplay of crops with livestock. This practice would reduce fertilizer and weed control costs while providing the farmer with greater market stability.

2. Diversify production regarding not only types of crops but individual strains of a single crop so as to reduce the risk of farm pests blighting the entire crop.

3. Reduce energy use by investing in more fuel-efficient machinery, looking into solar dryers, letting crops dry naturally whenever possible, adding insulation where feasible, and taking advantage of natural lighting in farm buildings. Investigate possibilities for using alternative energy sources, whether this be the conversion of manure into methane or the use of solar heat for crop drying and other on-farm energy requirements.

4. When dealing with different soil types in large fields, consider reducing field size for maximum ecosystem diversity. This would establish a healthier ecosystem which can vary greatly in one large field.[24]

5. Consider using management practices that will reduce the need for chemical fertilizers, pesticides, and other expensive inputs.

6. Investigate possibilities for using alternative energy sources, whether they be the conversion of manure into methane or the use of solar heat for crop drying and other on-farm energy requirements.

7. Develop on-farm fertilizer sources by growing nitrogen-fixing legumes and green manure crops.

8. Utilize marginal land in combination with more productive soils and proper management to maintain more cattle, thereby increasing beef and organic fertilizer production.[25]

9. Avoid routine spray schedules. Apply pesticides only when needed and target spraying to delay the onset of insect resistance, reduce undesirable residues, do minimal damage to beneficial insects, and decrease costs.[26]

10. Consider alternatives to pesticide use and/or reduction. These could be: integrated pest management involving monitoring pest levels for proper timing of applications, no-tillage, crop rotations and interplanting, narrow rows or broadcast seeding to establish a canopy sooner than with wide row spacing, and biological control of pests to maintain the natural ecosystem.[27]

III. Marketing/Economics

1. Organize marketing co-ops to provide restaurants, schools, and other institutions with locally-grown produce.

2. Work cooperatively with the consumer by selling directly to the public. This will ensure a higher price for the farmer's goods and fresher produce for the consumer at a lower cost.

3. Locate marketing centers strategically for the assembly, grading,

packing, and distribution of the output from many small producers thereby providing large buyers with the volumes and specifications they require.[28]

4. Consider small-scale processing on the farm such as processing sausage, cured meats, pickles, preserves, cheeses, etc. Fresh produce can be washed, sorted and packaged for sale to restaurants and markets. Dried beans, nuts, and seeds as well as honey can be sold to food stores and restaurants.

5. Investigate before planting what specific varieties of crops purchasers wish to buy by surveying bulk food purchasers in your area.

6. Sharpen marketing skills by examining price movements to forecast supply and demand. De-emphasize concentration on farm production while allowing time to think, plan, read and analyze the current market so as to obtain a better price for agricultural products.

7. Extend the availability of some produce by staggering planting and harvesting dates between the last frost date of the spring and first frost date of the fall and by selecting varieties with varying periods of maturation. For example the fall/winter oriental vegetable crops being developed at the Rodale Research Center are capable of extending the growing season in Pennsylvania.

8. Begin to work towards changing grading and marketing standards that reflect the nutritious quality of the crop rather than its uniformity and appearance.

9. Seek to reduce debt to manageable levels.

10. Encourage local newspapers, if a section is not already provided, to devote columns to farm problems and a listing of local/seasonal food availability.

RECOMMENDATIONS TO LOCAL GOVERNMENTS

1. Aid and encourage local food production and distribution by instituting a department to regulate and protect agricultural land use, encourage urban and rural food production, develop urban markets for local produce, initiate educational programs, and create plans to meet normal and emergency local food needs through local production and storage.

2. Identify the long- and short-term costs to a township before converting any prime farmland to development use.[33]

3. Develop and encourage local food production by:

   a. Establishing city-run gardens in low income areas, and/or providing seeds, tools, and technical assistance on gardening to those receiving food stamps and other kinds of food assistance.

   b. Providing funds to establish gardens and/or greenhouses and subsidizing gardens in schools, prisons, hospitals, and nursing homes.

   c. Establishing community farms on urban fringes to be worked by local farmers or interested city residents.

   d. Promoting contract growing whereby groups of urban families, co-ops, or the city itself arranges to purchase food directly from a local supplier.

   e. Developing loan funds for food self-reliance projects, such as greenhouses, food preservation and storage operations, and small businesses associated with urban agriculture.

   f. Establishing urban agricultural testing programs with the state Cooperative Extension Service to test crop varieties, analyze soil for nutrients and pollutants, test crops for pollutant residues, prepare demonstration sites for various types of urban agriculture and waste recycling, and offer technical assistance on farming as well as design and construction of community greenhouses, cold frames, rooftop gardens, etc.

   g. Encouraging local industries which produce low grade waste heat to make use of this energy by producing food in attached greenhouses.

   h. Requiring garden areas in new multiple unit housing projects.[34]

   i. Making certain that urban street tree programs preserve solar access for food production.[35]

4. Develop and encourage local markets by:

   a. Establishing farmers' markets in the city, particularly in low-income neighborhoods, and facilitating authorizations for farmers to accept food stamps at the markets.

b. Creating mobile farmers' markets and/or fish markets to visit housing projects, neighborhood centers, factories, and universities.

c. Assisting in the formation of food cooperatives, co-op stores, and preservation/storage centers.

5. Develop and encourage local food processing and storage by sponsoring community food preserving facilities where residents use this service free or at a low cost and/or providing incentives to grocery stores to establish food preserving facilities for their shoppers.

6. Facilitate access to food by implementing a "food hotline" to provide referrals for emergency food, food stamps, and meals for elderly.

7. Create a greater understanding of the importance of agriculture to urban areas through educational programs. Offer seminars in urban agriculture, aquaculture, container and rooftop gardening, food preservation, storage preparation, and nutrition. (See AGRI-LEARN under Recommendations to State).

8. Establish food banks in your area to store and distribute surplus food.

9. Have county institutions purchase their food supplies from local farmers.

10. Preserve the remaining farmland in the vicinity by creating agricultural open-space preserves to retain prime farmland for agricultural use as in Lancaster County.

11. Set aside areas for recycling facilities.

12. Investigate the benefits of joint municipal planning. Amendment, Article XI-A, to the Municipalities Planning Code gives municipalities authorization to work together to enact and adopt joint municipal comprehensive plans and joint municipal zoning ordinances. This process of joint planning could be particularly beneficial for those communities wanting to adopt some form of agricultural zoning and/or transfer of development rights ordinance. The Newtown Area Joint Planning Group in Bucks County is one example of municipalities engaged in joint municipal planning.

13. Consider applying part of the monies from the real estate transfer tax to a local purchase of development rights program.

14. Investigate land use techniques like clustering, performance controls, and transfer of development rights which would give farmers greater options to develop either on the farm or in othe

areas within the community or region.

15. Establish an Agricultural Development Council similar to the one in Chester County. This council would focus on generating economic solutions to the problems of farmland loss in the counties. These local agricultural development councils would be comprised of people from the entire food system in the county and include farmers, processors, distributors, store managers, and farm service equipment dealers, as well as realtors and bankers. The council could develop local markets for local producers. It could survey local producers to see which ones would grow produce for local consumption and survey local stores, restaurants, and institutions to encourage them to purchase more locally grown foodstuffs. The council could also determine where local food is coming from and could promote more consumption of local foodstuffs. As suggested by Chester County, the council could become involved in "farm brokeraging" which would match new farmers with those who want to sell.

16. Increase the effectiveness of the soil erosion and sedimentation control measures under the Clean Streams Law by participating in (through local conservation districts) the enforcement of the law at the local level. Section 102.41 (a) of the Erosion Control Rules and Regulations allows the Department of Environmental Resources (DER) to "delegate the administration and enforcement of the provisions of this Chapter to counties and other units of local government." Of the 66 conservation districts there are only two, Lancaster County and Northampton County Soil Conservation Districts, which have contracted with DER to enforce the provisions of the soil erosion and sedimentation control measures. Although it is encouraging that 50 have agreed to inspect earthmoving activities (level 5 of the program), more should be willing to move to level 6 which gives them enforcement. Local enforcement is usually much quicker than enforcement through DER. DER is willing to provide local conservation districts with cost sharing in order to encourage their participation.[36]

17. In addition to enforcing the soil erosion and sedimentation control measures, pass local ordinances similar to the one in Sterling, Wisconsin, which is successfully conserving all agricultural lands over 1 acre in size with a slope greater than 6 percent.

18. Undertake joint cooperative agreements, Memorandums of Understanding -- as currently being carried out in Lancaster County -- with your local conservation district whereby Township Supervisors enable the district to review subdivision plans for adequacy of erosion sedimentation control and stormwater management, and give it permission to inspect earthmoving activities to insure implementation of erosion and sedimentation control practices.

19. Investigate the agricultural Land Evaluation and Site Assessment (LESA) system being developed by the Soil Conservation Service and the U.S. Department of Agriculture. The program will assist planners in identifying farmland that should be protected based on land capability, soil productivity, soil potentials, and important farmland rating.

RECOMMENDATIONS TO THE STATE

1. Promote agricultural production within Pennsylvania and in nearby states by:

   a. Offering incentives for farmers to diversify production, utilizing technical assistance from extension agents and low-interest state-guaranteed loans to make changes necessary for diversification.

   b. Mandating a study by our Department of Agriculture and Pennsylvania State University investigating the potential for producing various crops needed in the state.

   c. Establishing demonstration experiments to test crop, animal, and fish varieties suitable to our soil and climate as well as developing low-input sustainable farming techniques.

   d. Providing tax incentives for small-scale food producers, such as not taxing the first $10,000 of income from food produced for local consumption.

   e. Issuing state tax credits for home and farm production, processing, and storing of food.

   f. Encouraging new farmers through loans and incentives to enter into certain types of farming operations, those which would maintain the optimal balance of farm types in the state. (See Research Recommendations #1).

   g. Initiating a program like New England's Small Farm Management Assistance Program to provide practical farm management skills to small-scale commercial farmers on a one-to-one basis.[37]

   h. Organizing a farmer linkage program whereby experienced farmers bring prospective farmers into their operation easing the transfer of land ownership over time. In this way the new farmer would be more successful in avoiding costly farming mistakes while gaining the tenured operator's knowledge of the farm.

   i. Expanding programs such as the Livestock Products Marketing Program to encourage Pennsylvania farmers to produce these commodities and consumers to purchase them.[38]

   j. Establishing a statewide Agricultural Development Council which would seek to enhance the viability of farming throughout Pennsylvania in the same way that industrial development agencies seek to encourage industry to locate in-state. This kind of council would consist of representatives from all parts of the food industry.

2. Preserve remaining farmland in the state by:

   a. Publishing guidelines to help local governments protect agricultural land and enhance farming. These guidelines could include ways to prevent "leapfrog" or random development, which removes from production not only the land that has been developed, but which in the long run isolates adjacent farming areas and inhibits certain farming activities. The state could also delineate ways whereby municipalities could best protect farmland in urban fringe areas, and it could prepare guidelines for different kinds of farmland preservation strategies and techniques including agricultural zoning, transfer of development rights, purchase of development rights, community land trusts, performance zoning, and so forth. It could prepare procedures which would help local governments assess the different kinds of strategies that would be most appropriate and feasible for them, given the extent of farming in the area, development pressures, commitment of farming community to remain in agriculture, existing and potential land use, economic characteristics, natural features, and attitudes of local residents towards preserving farmland.

   b. Mapping all farmland that the state believes should be protected from development, identifying all Class I and II soils that are crucial to the agricultural capabilities of the state. The state of California has been engaged in mapping all of its farmland for the last few years in order to identify those areas that are important to the state for agricultural production.

   c. Instituting a farmland capital gains tax in ways which would discourage speculators from investing in farmland, and selling it for development.

   d. Creating a committee to inventory and monitor all state-owned farmland and assess its productive capability while working to ensure that this land remains in farming. We encourage the passage of S.B. 1283, which would provide for an advisory committee to manage state-owned farmland.

   e. Amending Act 442 in ways that will make it more appropriate to the farmland preservation strategies within local counties. Consider including a "right of first refusal" amendment in the Bill. The "right of first refusal" or preemption option is currently used in France, where owners of farmland within designated areas must by law notify a state-chartered nonprofit corporation of their intention to sell their land. The corporation has the right to buy the farmland within 30 days.

   f. Providing funds for the counties to make Act 43 a significant option for farmers. The state could consider using its revenues from a real estate transfer tax as well as from monies paid on penalties and back taxes from violations of Act 319. States could provide part of this money to counties on a matching basis which would encourage counties to share in the cost of a purchase of development rights program.

g. Amending Article 5, Section 107 of the Municipalities Planning Code so that the municipalities can regulate subdivisions even where it creates parcels of more than 10 acres for agricultural purposes.

h. Encouraging municipalities to work together through joint municipal planning by working together to enact and adopt joint municipal comprehensive plans and joint municipal zoning ordinances. This would be one way to achieve agricultural zoning on a more regional basis, which could anticipate many of the current challenges to its constitutionality.

i. Encouraging the passage of House Bill 2032, which would record agricultural land transfers on an annual basis.

j. Encouraging the passage of Senate Bill 151, which would promote the family farm by establishing a family farm security program to encourage loans for the purchase of farm real estate.

k. Reducing the capital gains tax for those farmers who sell farmland to young, beginning farmers, especially if farmland is sold at less than full market value. The state currently receives 2.2 percent of the gross.

l. Keeping a yearly record of how effective current farmland preservation legislation has been. This should include updated information on Acts 442, 43, 284, 515, 319, and 71. Periodic analysis should be conducted to explain why or why not the legislation is successful and whether or not amendments to the legislation are needed.

3. Stop or decrease the loss of our topsoil by:

a. Enforcing existing anti-erosion laws by establishing new penalties for erosion damage. This would involve prohibiting all agricultural production activities which result in more than four tons of soil loss per acre per year (maximum soil regenerative capability in PA).

b. Enforcing the soil erosion and sediment control law that requires a conservation plan for all agricultural lands in excess of 25 acres.

c. Linking economic programs, such as loans, crop insurance, disaster relief, and state purchase of farm commodities, to the avoidance of excessive soil erosion.

d. Instituting and enforcing a "severance tax" on soil losses due to excessive erosion to finance subsidies, to encourage conservation practices, and to pay for downstream dredging of silt, damage to water treatment facilities, and other social costs.

   e. Establishing rewards for soil enrichment, such as tax credits for on-farm soil and water conservation programs, including contour tillage, minimum tillage, and crop rotation. Using public subsidies, such as low-interest loans, preferential farm property tax formulas and valuations, and other tax incentives to encourage cover and permanent cropping, minimum tillage, ridge planting, proper rotation, longer rotations, biological nitrogen fixation, contour plowing, terracing, stripcropping, leaving harvest residues on soil surfaces, reducing soil compaction and salinity, intercropping, and regional organic waste recycling.

   f. Developing incentives for encouraging the use of rental arrangements which include provisions for sharing erosion control and soil enrichment costs with the landowner.

   g. Developing public awareness programs to promote understanding of the need to support sound soil conservation practices.

4. Expand local markets by:

   a. Establishing more farmers' markets and organizing wholesale farmers' markets to supply retailers, consumer co-ops, and other volume purchasers.

   b. Increasing promotional efforts for direct purchase of food from farmers by supermarkets, restaurants, schools, hospitals, and other institutions.

   c. Encouraging existing processing plants to purchase locally-grown products.

   d. Developing linkages between large-volume food buyers and Pennsylvania producers, an example of which is outlined under Strategic Theme II "Pennsylvania should Encourage Local Markets."

   e. Giving preference to in-state producers in bidding for the sale of foods by permitting state institutions to purchase foodstuffs directly from local farmers and in-state producers at prices at or in excess of the lowest submitted bid according to a percentage to be determined by the state. This may require amending the Administrative Code of 1929, Section 240E. An example of this kind of policy is the state of Maine's 1979 law relating to state agency purchase of Maine's farms and fisheries products. Massachusetts is also considering such a law.

   f. Providing assistance to small growers through a statewide marketing clearinghouse.

g. Assessing the viability of implementing in Pennsylvania marketing alternatives to determine price and maintain market access for individual farmers through electronic commodity markets, vertical coordination through forward contracting, forward deliverable contract markets, and mandatory public reporting of market information. Other options include exclusive agency bargaining, vertical integration through ownership, joint ventures between agricultural cooperatives and agribusiness-marketing firms, marketing orders, and marketing boards.[39]

h. Establishing regional livestock marketing committees to evaluate alternatives such as regional market centers owned and operated by either a local or a regional cooperative, a regional electronic sales exchange, and contract sales to packers, while providing for more direct movement from producer to slaughterer thereby decreasing costs.[40]

5. Strengthen in-state food-processing capabilities by:

   a. Providing incentives for existing food companies to develop more energy-efficient processing and packaging techniques, along with incentives to attract new food processors who wish to reduce transportation costs by locating near a major distribution center.

   b. Helping to establish community food processing and storage facilities for the use of families and small commercial food producers. In this way, economies in equipment and energy consumption can be realized.

   c. Providing incentives for on-farm processing, cooling, and fresh packing of local food crops.

   d. Encouraging the passage of House Bill 1472 which follows the model law recommended by the Food and Drug Administration that over 40 states have now adopted. The law would bring the state food processing regulations into conformity with federal standards. This standardization would encourage more food processors to locate in Pennsylvania.

6. Effect a transition from depletable to renewable energy sources by conducting regional inventories of all renewable energy sources and providing incentives, such as tax credits or low-interest loans for investments made in agricultural energy conservation and on-site development of renewable energy sources, or tax exemptions for income received from the production of renewable energy.

7. Recycle organic wastes to utilize their full potential by:

   a. Preparing a state-wide inventory of the types and amounts of organic wastes available now and in the future and assess the ability of these wastes to improve soil fertility and tilth and their potential energy use.

   b. Developing incentives for using local organic wastes for fertilizer and incentives to industry to separate toxic substances from their wastes so that they might be more safely used on cropland.

8. Enact a bill which requires returnable bottles and the recycling of metal cans. This would reduce materials consumption in the food system.

9. Protect the natural environment by enforcing existing environmental protection laws, developing programs for safer handling of toxic pesticides and stronger enforcement of laws against pesticide misuse, and developing stricter standards for pesticide residues in foods. Collect data on pesticide use in Pennsylvania.

10. Develop long-range food system plans by:

    a. Revising and improving the methods by which crops and livestock production data are gathered so that the future direction of the state's agriculture situation is determined based on accurate, reliable information.

    b. Creating an overall state food policy which will increase regional self-reliance and economic viability while decreasing the vulnerability of the state's food supply.

    c. Planning for an emergency food supply disruption by strengthening our grain storage facilities capacity.

    d. Conducting an annual study of the condition of the state food system to find out the amount of food currently being imported and exported, soil erosion losses, amount of land lost to development, and other food system issues while stating what Pennsylvania can do to increase its self-reliance.

11. Instill a greater understanding of agriculture's role in all Commonwealth citizens by:

    a. Increasing awareness of seasonal, locally-grown produce, and its nutritional and economic benefits.

    b. Initiating educational programs on farmland preservation, farm energy conservation, reduced pesticide and fertilizer use, recycling of organic wastes, and energy expenditures in different methods of farming and home food production and preparation.

    c. Expanding the AGRI-LEARN program of York County elementary schools to other counties. This is a curriculum enrichment program which brings American agriculture into the classroom.[41]

    d. Promoting nutrition education campaigns illustrating the relationships between diet and health and the benefits of fresh, locally-grown, and minimally processed foods, as well as bulk purchasing of food.

e. Communicating goals and the condition of our food supply as revealed in the state's annual study.

RECOMMENDATIONS TO THE FOOD INDUSTRY

1. Encourage sustainable farming methods by using the food industry's influence on farm production techniques to decrease the use of dangerous pesticides and increase the use of soil conservation measures. De-emphasize produce appearance while concentrating on freshness and nutritional quality.

2. Minimize energy and material use by using less processing (and/or more efficient methods), simpler packaging, and rail networks more often in transporting commodities.

3. Move towards regionalizing food purchasing, processing, and distribution, thereby decreasing transport costs and strengthening the local economy with increased use of local labor.

4. Promote the consumption of fresh, locally-produced food in season, enhancing consumer nutrition and building a stronger local economy.

5. Provide nutrition education, hints for food preparation, and techniques on preserving fruits and vegetables.

6. Focus on food in a holistic way, recognizing that diet is an essential component of a healthy life and is influential in preventing as well as treating illness.

7. Grocery stores should purchase and label for consumers Pennsylvania produce (as Weis markets do). Point-of-purchase literature could be made available to consumers to make them aware of where food originates and the issues involved with this.

RECOMMENDATIONS TO THE AGRICULTURAL RESEARCH COMMUNITY[42]

1. Determine the optimal mix of farm types in Pennsylvania to obtain sustainable yields of both crops and livestock to meet the state's consumption needs and to provide a sufficient level of exports. Determine the production needed to support processing plants for various commodities. If the commodity is produced in quantities sufficient to make a processing plant economically competitive, this would be an incentive for establishing those businesses in state. For example, the Department of Agricultural Economics at Penn State has developed a model which indicated that in many cases "too few broilers are produced in a region to justify the maintenance of a broiler processing plant."[43]

2. Assess relationships between biofuels development (including forest resources) and long term soil productivity to provide guidelines for future programs.[44]

3. Investigate how to improve the capability of using forage and Pennsylvania crop wastes.[45]

4. Continue and expand the small-scale-agriculture research program at Penn State. This will not only aid small-scale enterprises, but will also help large-scale farms diversify and become less dependent upon a single commodity. Efforts along this line will help meet local food needs and keep Pennsylvania farmland in production.[46]

    a. There is a need for smaller equipment which would use less energy and decrease the amount of soil compaction and erosion, at a cost that small operators can afford.

    b. Continue and expand research on fruits and vegetables and post-harvest handling methods to benefit small-scale producers.

    c. Continue livestock management and forage research programs aimed at smaller enterprises.

    d. Continue to develop beef feeding systems based on forages rather than high-energy grains.

5. Work to develop plants which resist pests and mature earlier so less drying is required.[47]

6. Investigate Pennsylvania's soil erosion problems, looking at crop residues, run-off, tillage practices, rotation systems, terraces, equipment use, etc.[48]

7. Investigate perennial agricultural systems (permaculture) appropriate to Pennsylvania to eliminate annual soil disturbance and decrease energy, fertilizer, pesticide, and herbicide usage.

8. Determine the long-term effects of recommended applications of chemical fertilizers, pesticides, and herbicides on the

productivity of selected Pennsylvania soils.

9. Update the Stanford Research Institute's inventory of the organic wastes in Pennsylvania which are available to improve soil fertility and tilth.

10. Investigate methods to utilize Pennsylvania municipal wastes in agriculture.

11. Expand research on biological nitrogen fixation.

12. Develop crop varieties adaptable to low-input farming systems in Pennsylvania.

13. Explore the potential of small-scale aquaculture in Pennsylvania to provide high-quality protein using cost-efficient and ecologically sound methods.

14. Set up plots to study the transition phase of switching from conventional to low-input farming systems.

15. Examine methods for producing food in cities, e.g. rooftop food production systems. Seek ways to make urban food distribution and marketing systems more accessible to local and regional food producers.

16. Develop more energy-efficient food processing, storing, and distribution techniques.

SUMMARY OF RECOMMENDATIONS

The preceding lists of recommendations are not easy reading. Some of the recommendations may seem hard to implement. Regeneration is never an easy process. But consider how much harder it will be to pick up the pieces should Pennsylvania's food system collapse.

Our recommendations should be viewed as a flexible agenda rather than a rigid program. They are based on what we know today. Tomorrow, as we learn more, we can revise our assessments of the problems and our options. We hope that part of our learning process will come from you in the form of feedback on what you've read in this report.

It is vital that we all realize we have the option to change our food system, and that we can exercise that option now. The time to begin planning for regeneration is today.

WHAT HAS BEEN DONE: AN ANALYSIS OF PENNSYLVANIA'S LAWS RELATING TO THE FOOD SECTOR

This section was written primarily for those readers who want an assessment of how effective our legislation has been in preserving farmland and helping the farmer, and for those who want an overview of some of the laws and programs the state has recently enacted or proposed to encourage agriculture and to meet in-state food needs. Some of the language and terms are of necessity technical. Because of its specialized nature and content we placed this section at the end of the report. We hope that those who are interested in the subject will benefit from its inclusion. Those who are less inclined towards reviewing legislation can simply omit the section.

Like many states confronting the erosion and loss of their agricultural resources, Pennsylvania has begun to take action. Slowly beginning in the late sixties, and finally accelerating during the current administration are the enactments of a series of laws and programs aimed at making the state's food system more sustainable. This legislation covers a wide range of objectives: decreasing soil erosion, retaining farmland, encouraging family farming, expanding the food industry, promoting Pennsylvania foodstuffs, and enhancing the economic viability of agricultural production. The current administration has publicly committed itself to highlighting agriculture as a "priority for the 1980's." These efforts are to be applauded. The following analysis is not intended to denigrate them but rather to suggest ways they can be improved.

RETAINING FARMLAND AND FARMERS: HOW WELL ARE WE DOING?

Since the late sixties, the Commonwealth has enacted a variety of laws targeted at preserving its agricultural resources and helping farmers prevail against the impacts of development pressure. Such legislation deals with increasing land values, which raise property taxes and the cost of agricultural land for farming purposes; conflicts between farm owners and surrounding residential areas; local government interference with farming activities; government condemnation for highways, reservoirs, and other public projects; and extension of public sewer and water services into farming areas. These laws have also sought to encourage farmers to keep farming rather than to "cash in" on the high value of their land. The following analyses of the strengths and weaknesses of Act 442, Act 43, Act 284, Act 515, and Act 319 show how these different laws were intended to address these problems, and how effective they have been.

While good intentions were unquestionably behind these laws, what begins to emerge is a legislative panorama whose features are not integrated with each other to achieve maximum impact. It is as if the legislators knew they needed certain elements but never anticipated how to design them in an effective way. Rather than any comprehensive state policy, farmland and farmer preservation has up to now been too much of a fragmented undertaking. In some cases the incentives that would give strength to certain laws are absent because they have already been applied elsewhere. Another major problem is the lack of funding commitment by the Commonwealth to help the legislation achieve its promise.

ACT 442

Its Intent

Signed into law in 1968, Act 442 sought to clarify and broaden the way by which the Commonwealth, counties, and their authorities could preserve open space. By definition, open space included farmland as well as water resources, forests, nature reserves, and so forth. The state or counties could acquire land in "fee-simple" (payment for full property rights) or through partial interest acquisition (through easements, deed restrictions, development rights). The significance of the Act lies in the process through which this full acquisition or less-than-full property rights acquisition can take place. First, the state or counties have to prepare a resource, recreation, or land use plan showing why the particular property or properties to be acquired would fulfill the open space objectives. Then they must gain the approval of their respective planning board, commission, and commissioners, and assess through public hearings the willingness of landowners to sell them full or partial interest in their land. Any full property rights which are acquired have to be offered for resale two years after the date of purchase. When the land is resold, restrictive covenants must be attached to the deed, limiting the future use of the property to that use specified in the plan.

Its Strengths

On paper Act 442 holds a lot of promise.

1. Though not an agricultural lands protection bill per se, one of Act 442's stated purposes is "to protect and conserve farmland."

2. The plan requirement means that farmland retention will not be a fragmented undertaking, but will have a rational, explicit policy behind it.

(Key farming areas may become part of agricultural preserves. Those areas most vulnerable to development could receive highest priority, or those areas evaluated as most sustainable could be targeted for this program.)

3. The acquisition effort is intended to be permanent. Farmland acquired in fee simple must be resold with restrictive covenants which remain with the deed indefinitely. Only if after a period of time the county or state decides the restriction is no longer warranted -- given changes to the surrounding areas -- can the restriction be removed.

4. The farm community is given incentives for not selling its land for conflicting uses such as development. In the short run, there is outright compensation either for the entire property or an easement. In the long run, the restrictions could lead to lowered property taxes. Land protected within a specified preserve area would less likely be subjected to interferences with common farming practices.

5. The role of the county in protecting environmentally sensitive natural areas, in guiding change, and in supporting local industry is enhanced by Act 442. In a state where major land use decisions such as zoning are made at the municipal level, Act 442 enables the county and the Commonwealth to take a comprehensive initiative to protect farmland.

6. Government bodies are not to become permanent owners of farmland under Act 442. Within a specified time all land purchased in fee simple must be returned to the private market with restrictions on its future use.

Its Weaknesses

In reality Act 442 has borne little fruit. Fourteen years after enactment the law has never retained a single farm and has not kept agricultural land from going out of production or from being sold for conflicting uses. Its only open space application was in the late sixties when the Bucks County Neshaminy Creek Water Resources Authority (NCWRA) acted under Act 442 to buy flood plain property for its intergrated water supply, flood control, water quality, conservation, and recreation program.

Why has the act been so unproductive?

1. The most apparent reason is the lack of funding commitment by the Commonwealth, the counties, and their authorities. Without appropriate financing, any steps taken are accomplishing little more than marking time. The purpose of the act is to acquire and resell land with permanent restrictive agreements and that requires some level of funding.

2. Though lack of funding is the most obvious reason, there are certain ambiguities and weaknesses within the law itself which may have deterred some counties from using it. Since June 1981, Lancaster County has sought amendments to Act 442 through H.B. 1499 in order to make the act more appropriate to its comprehensive farmland preservation strategy and its deed restriction program. Right now the outlook is bleak on passage of the amendments. Lancaster County is beginning to consider other approaches which may well side-step Act 442.[1]

3. One inherent weakness of the act is that it permits any landowner with property in an area targeted for preservation to request that his land be purchased in its entirety, in fee simple. There may well be some farms within an agricultural preserve area which are less vital to county interests than other farms. To require the county to pay in full for any farm in a preserve area -- should the owner request it -- could sap the financial resources of the county and not necessarily further the goal of farmland retention. As originally recommended by Lancaster County, "it should be possible for the county to designate agricultural preserves without obligating the County to

take any particular action on any particular parcel."[2] H.B. No. 1499 proposes that the Commonwealth or the counties "may acquire the fee simple."

4. Although Act 442 stipulates that land purchased in fee simple must be offered for resale two years after the date of purchase there is no assurance that the land will be sold. Because of the restrictive agreements, the county may find that bidding is unacceptably low. Two years after purchasing property under Act 442, the Neshaminy Creek Water Resources Authority offered it for sale. Bids were so low that the land was withdrawn from public sale and it took 12 to 13 years before it was put back on the market again. Only in 1982 is settlement finally being made.[3] Although counties can lease such land until final sale, it may be hard in some cases for them to quickly recoup part of their outlay.

5. In spite of its requirement that selective areas be designated through a land use or resource plan, Act 442 offers no assurance that farm properties within those areas will be retained in farming unless restrictive agreements are placed on them. If a farm owner wants to sell his farm, there is no stipulation that he or she need first notify the government of this intent. This first notification process -- known as the "right of first refusal" -- would give the state or county the opportunity to purchase or refuse to purchase the property for agricultural use. Originally framed into a separate bill, H.B. 1983, in November, 1979, the concept of giving the government the right of first refusal now lies dormant. The bill itself died from neglect during the last session.

6. One ambiguous aspect of Act 442 is whether there would be a further reduction in property taxes for a farm owner who already participates in a current use assessment program, either under Act 515 or Act 319. This question also needs to be answered for all restrictive agreements, including easements

and purchase of development rights.

In summary, Act 442 was well intentioned but has not done a thing to preserve Pennsylvania's farmland. As it presently stands, it is useless. It needs to be amended to make it a worthwhile tool for preserving Pennsylvania's most vital resource.[4]

ACT 43

Its Intent

The passage of Act 43, the "Agricultural Area Security Law," in 1981, finally gave to Pennsylvania farmers the same opportunities to create exclusive farming areas which had been available to their counterparts in Maryland since 1979 and in New York since 1971. Incorporating different aspects of the two neighboring "district" laws, Act 43 enables one or more farm owners to create an agricultural area of no less than 500 mostly contiguous acres, within which the farmer will be secure from basic infringements on farming activities. For a minimum of 7 years, farmers in agricultural areas can be assured of limitations on nuisance ordinances and the exercise of eminent domain (condemnation). They are also eligible for financial benefits if the county they are in adopts a purchase of development rights program.

Its Strengths

Given the recent enactment of Act 43, it is too soon to evaluate how well the law is working. The "Rules and Regulations" for applying the law appeared January 30, 1982. It is possible to look at those benefits Act 43 seems to offer as well as its apparent vulnerabilities.

1. From the point of view of the farm community, Act 43 is important in that it encourages farm owners to voluntarily agree to form farming areas. The farmer is the initiator, rather than any government entity.

2. This voluntary initiative gives farmers a psychological benefit of control and the creation of farming areas gives the community or county the benefit that farming will be retained for a specified number of years. This in

turn could have rippling effects on the agricultural service sector and local businesses.

3. From the point of view of local government, the administration and control over the district are locally based. Approval of an area rests with town, township, city, or borough.

4. There are limitations on local regulations and on government condemnation for those in agricultural areas.

5. The farm owner does not lose his property rights but only temporarily relinquishes the right to sell the land for conflicting uses. After the 7 years have terminated, the owner may withdraw from the area.

6. The law enhances the county's authority to adopt a purchase of development rights program for farm owners in agricultural areas.

Its Weaknesses

1. Except for the psychological benefits, Act 43 offers farmers little more than what they already have in the way of monetary incentives. Unlike New York, where current use assessment -- assessing land at its use or agricultural value -- is only given to farmers who join a district, Pennsylvania has given all its farmers state and county current use assessment laws, Acts 319 and 515, as an option. Should there be enactment of H.B. No. 1823, the "right to farm" bill which "protects agricultural operations from nuisance suits and ordinances under certain circumstances," one of the strengths of Act 43 could be dissipated. Farmers would not have to join an area in order to receive protection from local nuisance ordinances. On the other hand, the "right to farm" law would make protection from nuisance suits and ordinances available to those farmers in developing communities who may be unable to form a district.

2. Agricultural areas cannot be relied on as a permanent way to retain farmland. Seven-year renewal periods presume a situation of impermanence.

3. The option of permanence through a purchase of development rights program is only meaningful if a county chooses to adopt one. However, there are no state funding sources targeted for county use. The act simply says that a county may use "moneys from its general fund and/or incur debt to make available moneys to purchase the development easements in agricultural areas" (Section 14). The prototype agricultural areas program in Maryland promotes the linkage between farming areas and purchasing development rights through an interplay of funding sources: a statewide real estate transfer tax, an agricultural transfer tax, and distribution of grants to counties with districts or areas.

The Commonwealth needs to investigate funding sources so that counties can realistically begin purchase of development rights programs. One avenue to explore is setting aside a proportion of its revenues from its real estate transfer tax. There is a 2% tax on all real estate transfers in the state, with half going to the state and half going to municipalities which share their returns with the local school district. In 1979, the state collected $92.7 million and in 1980, $75.8 million from the tax.[5]

Although the amounts may be low, considering the millions of dollars potentially needed to purchase development rights, setting aside that tax income would demonstrate that the state was in earnest about its agricultural lands preservation policy. Furthermore, if this money were given to counties on a matching basis, it would encourage counties to initiate their own revenue-raising programs and thus share in the cost.

4. Even with a county-funded purchase of development rights program, there is nothing to prevent a hole in the doughnut situation from occurring. A

farm owner in the center of an area may decide to withdraw from that area and/or reject an offer for his development rights. If his neighbors agree to remain in farming and he sells out for a conflicting use, the entire area may become jeopardized. To avoid this, a "right to first refusal" could be added to Act 43, or the counties could require that all development rights in each area be kept in escrow until each farm owner in an area has agreed to sell his development rights.

In summary, Act 43 holds promise if for no other reason than it shows a commitment by the farming community to protect and enhance its farming operations. Without financial backing, however, for an integrated purchase of development rights program, the law is very weak and cannot permanently preserve agricultural lands and farms in Pennsylvania.[6]

ACT 284

AGRICULTURAL ZONING

Its Intent

Agricultural zoning is intended to promote the continuation of agriculture in areas best suited to the characteristics and needs of farming. Those land uses which are incompatible with agriculture or which create conflicts with farming are either excluded or severely restricted within agricultural zones. The power to zone in Pennsylvania is historically derived from the police power of the state. Local governments have had zoning authority since the 1920s through enabling legislation recorded in local codes. In 1968, this enabling legislation was codified statewide into the Pennsylvania Municipalities Planning Code, Act 247. In 1978, this zoning authority was enhanced through the passage of an amendment to the code, Act 284. Zoning now can legitimately be applied to preserving "prime agriculture and farmland considering topography, soil type and classification, and present use" (Section 604.3).

Its Strengths

Called by a host of different names -- Farm Residential, Agricultural Residential, Agricultural Protection, Agricultural Industry -- agricultural zoning has been applied by a number of townships in Pennsylvania. Since the passage of Act 284, 55 townships and 4 boroughs (all in southeastern Pennsylvania) have implemented agricultural zoning ordinances under the new provisions.[7] In some counties such as York and Lancaster, agricultural zoning has been a primary approach by which to preserve farmland and encourage the continuation of family farming.

How strong has agricultural zoning been? Some would argue, only as strong as the absence of challenges to its validity. Others would say that in principle zoning has much to offer.

1. Agricultural zoning segregates incompatible uses from farming areas. It reduces interferences with farming and the need for local ordinances limiting agricultural activities.

2. It recognizes farming as an economic activity rather than as a gentleman's pastime or as simply open space. In the case of agricultural industry zoning, it may help to revitalize neighboring areas experiencing a loss of farm-related businesses.

3. It restricts development on prime agricultural soils and reduces or halts the use of prime farmland for residential development.

4. At the same time it usually permits the farm owner some kind of development. This could take the form of a "fixed scale" which irrespective of farm size "fixes" the number of lots a farm owner can sell off for development, or a "sliding scale" which correlates the amount of subdivision for residential use with farm size. The larger the farm, the more lots the owner can sell.[8] It could also provide for clustering, in which residential units are "clustered" or grouped together in ways and ratios which give the farmer opportunities for development, but which retain most of the integrity of the farming operation by keeping open most of the farming area.

5. By controlling development, agricultural zoning can help stabilize agricultural land values, by enabling farmers to purchase farmland at prices they can afford, and by keeping property taxes down.

Its Weaknesses

In reality, agricultural zoning in Pennsylvania has had a tough row to hoe. It has been a particularly difficult method for suburban and semi-rural municipalities in the state where over the years agricultural zoning has been challenged on a variety of charges.

1. Zoning ordinances not comprehensive enough to include a breadth of housing types and densities have frequently been invalidated on the grounds of being exclusionary, such as happened in the 1980 Chester County case of Wetherill v. West Nantmeal Township, 406 A2d 827. The courts have scrutinized agricultural zoning regulations to ensure that townships are meeting their responsibility of the "fair share" demands for regional housing in other parts of the municipality. Unfortunately for some townships, trying to meet the "fair share" demands has been too much of a guessing game given the ambiguity of the "fair share" concept.

2. The court decided in the 1970 case, Concord Township Appeal, 439 Pa. 466, 268 A2d 765, that without an extraordinary justification, "large-lot" zoning (between two to three acres) was unreasonable and constituted a taking without just compensation. In the 1980 case of Martin v. Township of Millcreek in Lebanon County, 413 A2d 764, a 10-acre minimum lot size regulation was declared "confiscatory."[9] Only in extremely rural areas where farmland values remain more a function of agricultural use than development potential is agricultural zoning likely to be upheld on the grounds that it is not a "taking without just compensation." These are the areas where zoning is least likely to be challenged.

3. As one way to address the "taking" issue by compensating farm owners in an agricultural zone for restricting development, some townships have initiated transfer of development rights ordinances. This option is a way for farm owners in a zone who are prohibited or severely restricted from developing their land to transfer their development rights to landowners in a zone where development is encouraged. This type of transfer does not involve public

expenditures (as do purchase of development rights programs). Instead it is conducted on the private market between owners of land in the agricultural and development zones. Theoretically, the idea has much merit. In practice, its success rate has been very low. In Buckingham Township, Bucks County, since 1975 there has only been one transfer of development rights, and that between the same owner holding land in both zones.[10] One crucial problem is that in some townships agricultural enough to adopt agricultural zoning, there may be little demand for the kind of development that would generate the funds needed to pay for the development rights. In Buckingham Township there was little demand for development because the municipality did not put in public sewer facilities in the development zone.

4. Some believe that Act 284 will add weight to the claim that zoning for agricultural use is as legitimate as zoning for residential, commercial, or industrial land uses. Although agricultural zoning ordinances may now withstand the challenge of being "arbitrary" since one can demonstrate the delineation of agricultural zones on the basis of appropriate, natural resources, it may be hard for a township to justify why one farm on Class II soils is in an agricultural zone whereas another is not.

5. It is possible to circumvent the intent of agricultural zoning through limits placed on regulating subdivision in the Municipalities Planning Code. Although Article V of the Code authorizes municipalities to regulate "subdivisions" and "land development," they cannot regulate subdivision where it creates parcels of "more than 10 acres" for "agricultural purposes" (Section 107.21). In the recent case in York County, Hopewell Township Board of Supervisors v. Golla, 428 A2d 701 1981, the Commonwealth Court invalidated the township agricultural zoning regulations in spite of its "worthy purpose" because its method prevented the farm owners from subdividing their 140-acre

farm into 7-14 "farmettes." The acreage of each farmette would have exceeded the 10-acre minimum. The township argued that farm size smaller than 50 acres would decrease agricultural productivity and efficiency. The landowners nevertheless claimed that their proposed farmettes could qualify for agricultural use. Since these farmettes were to be greater than 10 acres, the court found that until the legislature amends the Code to revise this regulation on subdivisions, the township zoning ordinance is invalid.[11]

6. Even in the absence of court challenges (an unlikely situation), agricultural zoning is not a permanent process for retaining farmland and encouraging the continuation of farming. Over time municipal governments may decide that their zoning should be revised or even abandoned. Changes in land use surrounding the agricultural zones may require a reevaluation of their validity.

7. Agricultural zoning on a municipal basis is a very limited approach protecting and encouraging farming. Two neighboring agricultural townships may have two different sets of ordinances, one that is permissive and one restrictive. A third may have none at all and even encourage development which conflicts with farming in an adjacent township's agricultural zone. Some form of regional zoning which delineates agricultural zones on a regional basis could overcome the handicaps of this disjointed township by township process. For those townships which are primarily agricultural and not within proximity to a metropolitan area, it makes little sense that they must provide for every kind of housing density as well as industrial and commercial need. Urban communities are not required to raze apartments in order to create farmland to meet food needs, even though our prime farmland is disappearing and as population grows, our food needs are increasing.

8. One approach to agricultural zoning which could address the food need

issue on a more regional basis and which could avoid many challenges to its constitutionality is through joint municipal planning. With the amendment, Article XI-A, to the Municipalities Planning Code, Senate Bill 1008, and the Intergovernmental Cooperation Act, municipalities have authorization to work together to enact and adopt joint municipal comprehensive plans and joint municipal zoning ordinances.[12] Agricultural zoning could be undertaken under this kind of ordinance in a way which would ensure that the "fair share" needs of the municipalities are being met -- thus obviating the charge of exclusion. It could give agricultural zoning greater legitimacy since townships with primary farming areas would be the ones to have agricultural zones -- thus withstanding the claim of arbitrariness. It would also provide a market for techniques such as transfer of development rights since some municipalities will have commercial/industrial areas -- thus preventing the charge that zoning is confiscatory.

In summary, agricultural zoning in suburban and semi-rural municipalities seems fated to receive a battery of challenges to its constitutional validity. It may be very difficult for individual municipalities in urban fringe areas to withstand the assault. Because current enabling legislation precludes county and state-wide zoning, municipalities that want to undertake agricultural zoning could consider the merits of joint municipal planning.[13]

ACT 515 AND ACT 319

Their Intent

Acts 515 and 319 are current use assessment laws in Pennsylvania which enable owners of eligible land to receive a tax assessment based on current use if they agree to maintain that use. Farm owners under either act would be assessed on the basis of the agricultural value of their land, rather than the fair market value (development value). Act 515 was passed in 1965 to allow "certain counties of the Commonwealth to covenant with land owners for the preservation of land in farm, forest, water supply or open space uses." Act 319, the Clean and Green Act, was passed in 1975 to provide lowered assessment on agricultural and forest reserve land. Whereas Act 515 requires individual county enactment, Act 319 is statewide and available to eligible landowners throughout the state.

Covenant lengths vary between the two acts. Under Act 515 the agreement is 10 years and is automatically renewed each year. Under Act 319 the length is indefinite, but the covenant can be broken with a 30-day notice. A farm owner is eligible under Act 515 if he has at least 10 acres with no minimum farm income. To be eligible under Act 319 an owner must have at least 10 acres or a minimum farm income of $2,000 a year. Rather than offering carte blanche current use assessment, both acts penalize farm owners who break their covenants, requiring back taxes up to a prescribed number of years as well as a 5% compounded interest under Act 515 and a 6% interest under Act 319.

The intent of both acts is to aid the preservation of farmland by offering farm owners a break on their property taxes in exchange for an agreement that they will not subdivide their land at all (under Act 515) or that they will only convert two acres each year for residential, agricultural, or forest use, as long as the conversion does not exceed 10% of the land or 10 acres (under Act 319). To make it possible for a farmer to sell an entire farm and for children to inherit the farm without breaching an Act 319 covenant, the legislature amended Act 319. Under this amendment, Act 15, a farm owner who simply separates his land -- divides it into two or more tracts without changing the use -- would still receive use assessment and not be penalized.[14]

Their Strengths

Nearly all the states have some form of current use assessment, though not all have the additional taxation sanction ("deferred taxation"), or covenants ("restrictive agreements"), which Acts 515 and 319 contain.

1. The tax benefits of each act need to be seen in relationship to the market value of farmland and in comparison with the current assessed values of the land. In counties and municipalities where both of these are high, Acts 515 and 319 could markedly help to lessen the property tax burden. This is particularly true in urban fringe areas where the market value is significantly higher than the agricultural value. A recent summary of participation in Act 319 during 1981 reported there was an average 58 percent reduction in the amount of property taxes paid by participating farmers in 21 counties across the state.[15]

2. Farmland held under both acts will not be converted to a non-farming use within a given period of time (under Act 515) or indefinitely (under Act 319) without a penalty, which temporarily keeps some of the state's farmland under production. As of 1977, 8,892 landowners with 441,587 acres were enrolled in Act 515. Of the counties (all southeastern) under the Act, one had 61%, two, 77% and one, 81% of their county farm acreage under agreement. As of

1981, there were 18,022 landowners with 543,707 acres covering 32 counties participating in Act 319.[16]

Their Weaknesses

Evaluating the success of Act 515 and Act 319 depends on the perspective of the evaluator. From the point of view of those farmers who receive reductions in their assessment as a result of these laws, they can be regarded as a success. From the vantage point of policymakers who not only want to reduce the carrying costs of farmers but who also want to preserve farmland, the long-term benefits are questionable.

1. Tax relief for farm owners through Acts 515 and 319 does not necessarily mean that farmland preservation will be achieved. One major reason is that farmers still have more to gain economically from selling their farms than from receiving a tax reduction, or from having to pay back taxes for a certain number of years and a penalty which is far below market interest rates. High property taxes are not the only expenditure in the increasingly higher costs of farming. The total bill, even with a reduction in taxes, may reach intolerable proportions, forcing the farmer to sell. Retirement-aged farmers without children to carry on may need to cash in on the only investment they have, their land. For a host of reasons, it may become more advantageous to sell to the highest bidder, usually the developer. In this context the reduction in taxes and the restrictions in the form of penalties are negligible. Although temporarily relieving a specific fiscal burden, Acts 515 and 319 are no assurance that in the long run farmland will be kept in agricultural use. Many studies have indicated that current use or preferential assessment (as some refer to it) has only limited value in preserving farmland

or open space resources, unless it is coupled with other farmland preservation strategies.[17]

2. The method by which property taxes are assessed could have a decisive impact on how much tax relief Acts 515 and 319 offer. If a comparable sales method is used which looks at development values, farm owners in areas where market values are high will receive notable reductions. However, their counterparts in less pressured locations will receive far less of a reduction. In fact, it is possible that if land is underassessed before the adoption of Act 515 or Act 319, farmers would do better to pay their present assessed values rather than apply for special assessment. The low statewide level of participation in current use assessment programs is attributed in part to the *de facto* low assessment in some counties.[18] To be more equitable and uniform in giving tax relief to farmers, some counties use an appraisal system based on soil types and productivity. Sometimes this approach ignores such factors as orientation of the land and rainfall and can misrepresent the actual level of productivity on a specific site.

3. Another difficulty with this kind of property tax relief which preferentially helps one group of taxpayers is that it shifts the tax burden onto other taxpayers. If farmers pay less taxes and local government budgets remain constant or even increase -- given the "New Federalism" -- then someone else must pay for the services in the local community. The extent to which the tax burden shifts depends upon how much farmland is in the area and its prior contribution in financing local services. It also depends upon the amount of nonfarm property over which the loss in taxes can be spread. The results of a 1977 study of Act 319 showed that taxes increased for non-participating owners up "to $3.35 per acre for non-participating land and up to $133 for a house and a lot with a market value of $40,000."[19]

4. One unanticipated result of shifting the tax burden in areas where there is a lot of participating land in farms is that tax millage will have to increase if jurisdictions want to maintain the same level of revenues. For example, in one community where the participation in current use assessment meant a 32% loss of the total assessed value, there was a resultant increase of 9.74 mills in the tax base. Those farmers faced with increased millage while benefiting from current use assessment may find a substantial erosion of their tax savings.[20]

5. Some counties have found that Act 515, which has a broader basis for eligibility than Act 319, is primarily benefiting speculators. In Bucks County in southeastern Pennsylvania assessment records show "that a significant number of owners of preferentially assessed lands are land investment companies, realty firms, out-of-county owners, developers, and other possible speculators."[21] In Bucks County most of the applications in recent years under Act 515 have concerned 10-acre homesites. Although some may argue that these do preserve limited amounts of open space, and are areas where family gardening can take place, they are not helping to preserve farmland, nor are they a way to provide tax incentives to families who want to grow their own garden but who have one acre or less of land.

6. Another difficulty with Act 515 as noted by Bucks County is in its administration. Having lost a court case in which the subdivision of land under Act 515 was not considered a breach of covenant, the Board of Assessment Appeals believes it has no "solid administrative guidelines" upon which to defend its decisions. Furthermore, monitoring all of the potentially permitted subdivisions under Act 515 could turn into an administrative nightmare. Bucks County is in the process of considering the repeal of Act 515 and recommending that participants switch to Act 319.[22]

In summary, in the short run Acts 515 and 319 have helped farmers decrease their property taxes. In the long run, however, there is no assurance that current use assessment alone can retain our farmland. From a land use perspective, these laws are but a holding action. How long they will "hold" our farmland remains to be seen.

OVERVIEW OF RECENT LAWS: 1976 - 1982

The recent enactment and introduction of the laws and programs summarized here show that the Commonwealth is seeking to enhance the viability of its agricultural base. Although most of the laws are addressing the specific needs of the farming community, there are a few which speak directly to the consumer and food industry. Whether or not regeneration is occuring as a result of these laws is hard to determine in some cases because they are so new. For that reason the following measures are merely described. The state needs to conduct periodic in-depth evaluations of their effectiveness. It is also important not to fall into the trap of thinking that once a law is passed the problem being addressed is cleared up, and that legislation is the only way to solve our food system problems.

Agriculture Logo Program

One of the most successful non-legislative programs of the current administration is its Agriculture Logo Program. This program is directed at three areas: farmland preservation -- by increasing demand and markets for farm products; economic development -- by increasing demand for local food products; and energy conservation -- by purchasing food products through local sources and reducing the need for long distance transportation. The logo "Pennsylvania Agriculture...We're Growing Better" has become widely displayed and used by more than 160 firms for their promotion. In addition, point-of-sale material has been distributed to 3,000 farm and retail markets. Marketing guides help orient consumers to local farm and direct market sources. Brochures and calendars highlighting locally grown food in season are also very positive steps to make consumers more aware of the agricultural bounty in Pennsylvania.

FARMERS/FARMLAND PRESERVATION

Act 179

Act 179 exempts family farm corporations -- those that have at least 75 percent of their assets devoted to agriculture -- from paying capital stock tax. This is a 1 percent tax on the gross assets. The act not only benefits present family farm corporations but provides an incentive for those farmers with enough income to incorporate.

Act 207

Of significant benefit to all farmers is the 1980 amendment to the Inheritance and Estate Tax Act of 1961. Land devoted to agricultural use for three years preceding the death of the owner, and which has generated a minimum yearly gross income of $2,000, can be taxed on the basis of its agricultural value rather than its development or fair market value. This amendment is particularly important to those farmers in semi-rural, metropolitan fringe areas where the price of agricultural land far exceeds its value for farming purposes. Too often farm families have had to sell off either the entire farm or large tracts of land in order to pay the inheritance tax.

Act 104

To ensure that milk producers and cooperatives receive prompt payment from dealers and handlers and to protect them against the loss of milk payment because of purchaser default, the legislature recently enacted Act 104, the

Milk Producers and Cooperative Security Funds Act. Through it both a milk producers security fund and a cooperative security fund are established to provide a procedure to process claims.

Act 110

The Cooperative Agricultural Association Act amends an earlier act providing for the incorporation and regulation of cooperative agricultural associations. An association with annual gross sales of $100,000 or less may perform an annual audit by an audit committee of three or more members of the association appointed by the board. These members need not be certified public accountants.

Act 71

Act 71 exempts farmers from paying assessments for sewer and water lines which front or cross their land, as long as they do not use the service. This act benefits those farmers who already have their own on-site water and sewer sources. Although the record indicates that only 72 farm owners have signed up for it since its passage in 1976,[23] it is believed that this number does not actually reflect the many farmers who have been helped by it. Municipalities or authorities who install the lines may not have gone to the trouble to file a notice of record with the county recorder of deeds for the particular exemption. There may also have been a decline in the amount of sewer and water service extensions into farming areas since 1976, due to escalating costs and a recent drop in housing construction.

Senate Bill 151

Of special benefit to young farmers is the proposed Senate Bill No. 151, the Family Farm Security Program, to encourage loans for the purchase of family farm real estate. Through a family loan guarantee the Commonwealth would pay a lender 90 percent of the sums due. With a maximum term of 20 years the loan would be amortized over its term with equal annual payments of principal and interest. During the first ten years of the loan, the Department of Agriculture would annually pay the lender 4 percent of the outstanding balance due at the beginning of that year, while the applicant would make payments according to the stated interest rate. This proposed bill is particularly important both for those farmers who have less than $50,000 to start farming and for those farmers who want to expand their present farm operations. Although passage during this session is unlikely, given lack of funding, this type of legislation is an important way to offset the higher cost of farmland, especially for the beginning farmer.

House Bill 1823

Popularly known as the "right to farm" law, this bill would place limitations on local ordinances and public nuisance actions against normal agricultural operations, if the operations had lawfully existed one year or more prior to the date of bringing such action. Municipalities are to encourage "the continuity, development and viability of agricultural operations" within their jurisdiction.

Act 100

As a check and balance against the state's right to condemn farmland for highway purposes and disposal of liquid and solid waste, Act 100 amends the

Administrative Code of 1929 to establish an Agricultural Lands Condemnation Approval Board. This act has already protected farmland which might otherwise have gone out of production. The board must determine that there is no reasonable alternative to a particular state project before giving it approval.

House Bill 2032

Another proposed Act, House Bill 2032, seeks to establish an updated record by county of agricultural land transfers. It would require county assessors to periodically submit forms provided by the Department of Agriculture to show how much agricultural land is being lost to development.

Act 39

The act prevents aliens and foreign governments from purchasing more than 100 acres of agricultural land except if acquired through gifts or inheritance.

Soil Erosion and Sedimentation Control Law

Addressing the issue of erosion is the Soil Erosion and Sedimentation Control Law of the Clean Streams Act, which requires those undertaking earth-moving activities of 25 acres or more to implement a plan for controlling erosion. Those found in violation are subject to the fines and penalties in the Clean Streams Law. Enforcement is based on responses to complaints. How effective the law has been is unclear. The state expects to publish an evaluation of this program in 1984 with primary focus to be placed on construction site evaluations. The agricultural evaluation will assess the degree to which farmers are implementing the conservation plans and erosion control plans designed by the Soil Conservation Service.[24]

FOOD INDUSTRY

House Bill 1472

One piece of legislation which could positively influence attracting the food industry to Pennsylvania is the proposed House Bill 1472. This act follows the model law recommended by the Food and Drug Administration which has been already adopted by over 40 states.

APPENDIX:

PENNSYLVANIA FOOD SYSTEM ORGANIZATIONS

There are many organizations which directly or indirectly are working towards developing a sustainable food system in Pennsylvania. Among those listed under "Consumers" are organizations which provide information about starting home gardens, food co-ops, farmers' markets, land trusts, community gardens, and food assistance programs, and which foster consumer awareness about land use and environmental issues relating to the food system, especially farmland preservation. Listed under "Farmers" are those groups which promote a specific kind of farming and which offer planning services for evaluating the different options farmers have for the future use of their land. Those mentioned under "Food Industry" serve as a guide to certain major organizations dealing with different aspects of the state's food industry -- producing, processing, marketing, and distribution. Readers are encouraged to learn about the services of the different groups and where appropriate, to join with them. Changing our food system will occur much faster as more people participate.

CONSUMERS

1. Brandywine Conservancy, Inc.
H. William Sellers
P.O. Box 141
Chadds Ford, PA 19317
(215) 388-7601

2. Community Action Services
Steve Weinberg
920 Olive Street
Scranton, PA 18510

3. Cornucopia Project
Medard Gabel
Rodale Press
33 East Minor Street
Emmaus, PA 18049
(215) 967-5171

4. Dairy and Nutrition Council-Mid East
Shadyside Centre
Suite 5100, Centre Avenue
Pittsburgh, PA 15232
(412) 682-3373

5. Nutritional Development Services
Hazel Preston
Archdiocese of Philadelphia
222 North 17th Street (13th Floor)
Philadelphia, PA 19103
(215) 587-3767

6. Pennsylvania Citizens' Advisory Council
8th Floor
Executive House
P.O. Box 2357
Harrisburg, PA 17120
(717) 787-4527

7. Pennsylvania Coalition on Food
and Nutrition
112 Market Street
Room 810
Harrisburg, PA 17101
(717) 233-6705

8. Pennsylvania Environmental Council
Eleanor W. Winsor
225 South 15th Street
Philadelphia, PA 19102
(215) 735-0966

9. Pennsylvania Food Co-op
Development Program
222 North 17th Street
Philadelphia, PA 19103
(215) 587-3767

10. Urban Gardening Program
Libby Goldstein
Pennsylvania State University
Southeast Corner Broad and Grange
Philadelphia, PA 19147
(215) 224-1821

11. Western Pennsylvania Conservancy
316 Fourth Avenue
Pittsburgh, PA 15222
(412) 288-2777

FARMERS

1. Brandywine Valley Association, Inc.
Robert Struble, Jr.
1760 Unionville - Wawaset Road
West Chester, PA 19380
(215) 793-1090

2. Dairy Council, Inc.
P.O. Box 129
Southampton, PA 18966
(215) 322-0450

3. Dairy and Nutrition Council - Mid East
Shadyside Centre
Suite 5100, Centre Avenue
Pittsburgh, PA 15232
(412) 682-3373

4. Eastern Milk Producers
Cooperative Association, Inc.
6567 Kinne Road
Syracuse, NY 13214
(315) 446-0730

5. Inter-State Milk Producers' Cooperative
1225 Industrial Highway
Southampton, PA 18966
(215) 322-0200

6. Keystone Milk Marketing Council, Inc.
Room 308
2301 North Cameron Street
Harrisburg, PA 17110
(717) 787-4210

7. Milk Marketing, Inc.
Pittsburgh Division
112 First Financial Plaza
150 West Beau Street
Washington, PA 15301
(412) 228-5350

8. Mushroom Growers Co-Operative Association
of Pennsylvania
P.O. Box 375
Kennett Square, PA 19348
(215) 444-3910

9. Natural Lands Trust, Inc. and
Philadelphia Conservationists, Inc.
Andrew Johnson
1339 Chestnut Street
Philadelphia, PA 19107
(215) 567-5590

10. Pennsylvania's Agricultural-Women
Maple Lawn Farms
New Park, PA 17352
(717) 382-4878

11. Pennsylvania Agricultural Safety
Council
204 Agricultural Engineering Bldg.
University Park, PA 16802
(814) 865-7685

12. Pennsylvania Association of Farmers
Cooperatives
c/o William Shaefer
RD 3
Tunkhannock, PA 18657
(717) 836-3575

13. Pennsylvania Association of Future
Farmers of America, Inc.
c/o James Fink
Pennsylvania Department of Education
P.O. Box 911
333 Market Street
Harrisburg, PA 17108
(717) 783-6954

14. Pennsylvania Association of Milk
Dealers
100 Walnut Street
Harrisburg, PA 17101
(717) 238-1738

15. Pennsylvania Beef Council
862 Webster Drive
State College, PA 16801
(814) 238-5888

16. Pennsylvania Cooperative
Sheep and Wool Growers Association
RD 4, Box 524
Manheim, PA 17545

17. Pennsylvania Cooperative Swine Breeders Association
c/o Ronald Trostle
RD 2, Box 246
Red Lion, PA 17356
(717) 757-6062

18. Pennsylvania Dairy and Allied Industries Association
Farm Show Complex
P.O. Box 3362
Harrisburg, PA 17105
(717) 787-2905

19. Pennsylvania Dairy Goat Association
RD 4, Box 315
Tarentum, PA 15084

20. Pennsylvania Dairy Sanitarians Association
RD 1, Box 393
Conestoga, PA 17516
(717) 872-4592

21. Pennsylvania Dairymen's Association
P.O. Box 458
Camp Hill, PA 17011
(717) 938-5404

22. Pennsylvania Egg Marketing Association
4210-A Sussex Drive
Harrisburg, PA 17109
(717) 545-3684

23. Pennsylvania Farm and Power Equipment Association
4605 Locust Lane
Box 4401
Harrisburg, PA 17101
(717) 545-3120

24. Pennsylvania Farmers Association
P.O. Box 763
510 South 31st Street
Camp Hill, PA 17011
(717) 761-2740

25. Pennsylvania Farmers Open Air Market Association
Oak Grove Farms
Pitman, PA 17964
(717) 648-4086

26. Pennsylvania Farmers Union
Suite 608, Locust Court
212 Locust Street
Harrisburg, PA 17101
(717) 232-9648

27. Pennsylvania Forage and Grassland Council
c/o Richard Hann
Milton Hershey School Farms
Hershey, PA 17033
(717) 534-3507

28. Pennsylvania Foundation Seed Cooperative
P.O. Box 203
Jersey Shore, PA 17740
(717) 398-2800

29. Pennsylvania Livestock and Allied Industries Association, Inc.
Farm Show Complex
P.O. Box 3362
Harrisburg, PA 17105
(717) 787-2905

30. Pennsylvania Maple Syrup Producers' Council
c/o Robert Hess
RD 1
Montrose, PA 18801
(717) 278-3285

31. Pennsylvania Nut Growers Association
c/o Albert Magee
Route 3, Box 78
Duncannon, PA 17020
(717) 834-4611

32. Pennsylvania Pork Producers Council
RD 2, Box 219
Kutztown, PA 19530
(215) 285-6519

33. Pennsylvania Poultry Federation
500 North Progress Avenue
Harrisburg, PA 17109
(717) 652-7530

FARMERS (Continued)

34. Pennsylvania Raw Milk Producers-Distributors Association, Inc.
RD 10, Box 300
York, PA 17404
(717) 792-3216

35. Pennsylvania Red Cherry Growers Association
c/o Adams County Extension Service
999 Lincoln Way West
Gettysburg, PA 17325
(717) 334-6271

36. Pennsylvania State Beekeepers Association
c/o Mrs. Glenn Crimbring
RD 1, Box 209
Canton, PA 17724
(717) 673-8201

37. Pennsylvania State Council of Farm Organizations
1604 North Second Street
Harrisburg, PA 17102
(717) 234-5001

38. Pennsylvania State Grange
1604 North Second Street
Harrisburg, PA 17102
(717) 234-5001

39. Pennsylvania Vegetable Growers Association
Waverly Road
Dalton, PA 18414
(717) 563-2690

40. Pennsylvania Young Farmers Foundation
c/o Carl Herr
Pennsylvania Advisor Council of Vocational Education
Suite 410, City Towers
301 Chestnut Street
Harrisburg, PA 17101
(717) 232-7653

41. Society of Farm Women of Pennsylvania
c/o Mrs. Alton Stapleton
RD 1
Saxton, PA 16678
(814) 635-3872

FOOD INDUSTRY

1. Inter-State Milk Producers Cooperative
1225 Industrial Highway
Southampton, PA 18966
(215) 322-0200

2. Keystone Milk Marketing Council, Inc.
Room 308
2301 North Cameron Street
Harrisburg, PA 17110
(717) 787-4210

3. Milk Marketing, Inc.
Pittsburgh Division
112 First Financial Plaza
150 West Beau Street
Washington, PA 15301
(412) 228-5350

4. Pennsylvania Association of Meat Processors
RD 3, Box 904
Mount Joy, PA 17752

5. Pennsylvania Association of Milk Dealers
100 Walnut Street
Harrisburg, PA 17101
(717) 238-1738

6. Pennsylvania Egg Marketing Association
4210-A Sussex Drive
Harrisburg, PA 17109
(717) 545-3684

7. Pennsylvania Food Merchants Association
Main Office: P.O. Box 10009
2426-30 Parade Street
Erie, PA 16514
(814) 454-3844
Legislative Office: 224 Pine Street
Harrisburg, PA 17101
(717) 234-6031

8. Pennsylvania Food Processors Association
Keystone Building
Room 401
22 South Third Street
Harrisburg, PA 17101
(717) 238-1252

9. Pennsylvania Grocers Association
Beury Building
3701 North Broad Street
Philadelphia, PA 19140
(215) 228-0808

10. Pennsylvania Livestock, Dairy and
Allied Industries Association
Farm Show Complex
P.O. Box 3362
Harrisburg, PA 17105
(717) 787-2905

11. Pennsylvania Meat Packers
Association
327 East Park Avenue
State College, PA 16801
(814) 237-7022

12. Pennsylvania Poultry Processors
Association
4210-A Sussex Drive
Harrisburg, PA 17109
(717) 545-3684

13. Pennsylvania Raw Milk Producers-
Distributors Association, Inc.
RD 10, Box 300
York, PA 17404

NOTES - Where Do We Stand?

1. U.S. Department of Agriculture, Soil Conservation Service, Pennsylvania National Resources Inventory 1980.
2. Pennsylvania Department of Agriculture, Pennsylvania . . . We're Growing Better!
3. Pennsylvania Department of Agriculture, Pennsylvania Crop and Livestock Annual Summary 1980 (Harrisburg: Pennsylvania Department of Agriculture, 1981), p. 72; Pennsylvania . . . We're Growing Better!
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5. Pennsylvania Food Imports chart.
6. Telephone interview with Mary Birch, Census of Agriculture, Bureau of the Census, March 1982.
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8. Pennsylvania imports 3,520,665,660 pounds of meats, poultry, and fresh fruits and vegetables per year. A fully loaded truck carries 40,000 pounds.
9. U.S. Department of Agriculture, Fresh Fruit and Vegetable Unloads in Eastern Cities (Washington, D.C.: Government Printing Office, 1981), pp. 64, 75.
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13. Telephone interview with John McNelis, Pennsylvania Grocer's Association.
14. Telephone interview with John McNelis.
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18. M. C. Hallberg, "Testing for Change in Pennsylvania Agriculture, A Modeling Technique," *Farm Economics* of the Cooperative Extension Service of Pennsylvania State University, December 1981, p. 1.

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20. *Pennsylvania Crop and Livestock Annual Summary 1979* (Harrisburg: Pennsylvania Department of Agriculture, 1980), pp. 27, 49. *Pennsylvania Crop and Livestock Annual Summary 1980*, pp. 29, 69.

21. *Pennsylvania Crop and Livestock Annual Summary 1980*, pp. 27, 64, 54, 68.

22. *Pennsylvania National Resources Inventory 1980*, pp. 2, 3.

23. *Pennsylvania National Resources Inventory 1980*, p. 2. Pittsburgh has an area of 55.2 square miles.

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25. National Agricultural Lands Study, Comp., *Pennsylvania Fact Sheet* (Washington, D.C.: National Agricultural Lands Study, 1980).

26. *Pennsylvania National Resources Inventory 1980*, p. 2.

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32. "Number of Farms and Land in Farms, Pennsylvania and United States", *Pennsylvania Crops*, December 1981, p. 3.

33. U.S. Department of Commerce, *1978 Census of Agriculture* Part 38, Pennsylvania (Washington, D.C.: GPO, 1980), p. 3.

34. Pennsylvania Crop Reporting Service, Record of Number and Size of Farms chart.

35. U.S. Department of Agriculture, Summary of Appraisal, Parts I and II and Program Report of the Soil and Water Resources Conservation Act (Washington, D.C.: GPO, 1980), p. 31.

36. Frank Spencer, "New Farm Borrowing Woes Mesh with Interest Hikes," Farmland News, April 15, 1982.

37. U.S. Department of Agriculture, Economic Indicators of the Farm Sector, State Income and Balance Sheet Statistics, 1980, Statistical Bulletin No. 678 (Washington, D.C.: GPO, 1981), p. 190.

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39. Telephone interview with Tom Rogers, Butler Farm Credit Service March 1982.

40. Letter received from Dr. Robert Cunningham, Department of Agronomy, Pennsylvania State University, March 1982.

41. U.S. Department of Commerce, 1978 Census of Agriculture, Part 38 Pennsylvania, p. xiii.

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44. M. C. Hallberg, "Testing for Change," p. 1.

45. Seth S. King, "When Farmers Are Hurting, Small Towns Feel the Pain," New York Times, April 11, 1982, p. E5.

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48. Theodore R. Eichers, Farm Pesticide Economic Evaluation, 1981, Agricultural Economic Report No. 464 (Washington, D.C.: GPO, 1981) p. 5.

49. Nathan L. Hartwig, Stanley G. Gesell, and Samuel A. Dum, Pesticide Use Survey for Agronomic Crops for Pennsylvania (State College: Pennsylvania State University, 1980).

50. Hartwig, et.al., Pesticide Use Survey, p. 1.

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53. "Soil Tests, Manure Application, and Legumes," *Energy and You*, Special Circular No. 242. (State College: Pennsylvania State University, n.d.), p. 1.

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56. *Crop, Forestry, and Manure Residue Inventory, Continental United States* (Menlo Park: The Stanford Research Institute, 1976), p. 10.

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58. *1980 Industrial Directory* (Harrisburg: Department of Commerce, 1981), p. 569-594.

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63. Hallberg, "Testing for Change," p. 2.

64. Letter received from Harry M. Carrol, General Manager for Communications, H. J. Heinz Company, 17 February 1982. Telephone interview with Drew Machamer, American Home Foods and Products; March 1982.

65. Telephone interviews with: Leonard Marsico, Export Manager, Hanover Brands, Incorporated; Charles Bushey, MFP Enterprises, Incorporated; Tom Summers, Charles J. Summers, Jr., Incorporated.

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67. Murray S. Aboff, "A & P Shut 386 Units in its Latest Pruning," Supermarket News, 8 March 1982, p. 2.

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69. Telephone interview with Yvonne Davis, Bureau of the Census, Philadelphia, March 1982.

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3. Rodale Press, Comp., Pennsylvania Food Imports chart. Assuming that half of the dairy acreage of 5,113,814 acres is in pasture.

4. Telephone interviews with: Jerry Schluter, USDA; Dr. Forest Muir and Herb Jordan, Department of Poultry Science, Pennsylvania State University; March, 1982.

5. Calculations based on 8,873,086,174 pounds of manure that would be economically recoverable from raising all the meat animals consumed in Pennsylvania.

6. Calculations based on 8,873,086,174 pounds of manure as above with an energy value of 16 x 10^6 BTU/ton and an efficiency of 60%. S.S. Penner and L. Icerman, Energy, Vol. II, (Reading: Addison-Wesley Publishing Co., Inc., 1975), p. 357; W.J. Jewell, ed., Energy, Agriculture and Waste Management, (Ann Arbor: Ann Arbor Science, 1975), p. 399.

7. M.C. Hallberg, "Testing for Change," p. 1.

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9. Rodale Press, Comp., Pennsylvania Food Imports chart.

10. Letter from and telephone interview with Charles Slayton, 27 February 1981 and 30 April 1982. Pennsylvania has 732,000 acres of occasionally improved hayland in land capability classes I, II, and III.

11. Telephone interview with Dr. Albie Voight, Pennsylvania State University, March 1982.

12. M.C. Hallberg, "Testing for Change," p. 1.

13. Telephone interview with Bruce Butterfield, Research Director, Gardens for All, February 1982.

14. Gardens for All, National Gardening Survey 1980-1981, pp. 11, 12, 21.

15. Gardens for All, National Gardening Survey, 1980-1981, pp. 11, 12, 21; USDA, Food Consumption, Prices, and Expenditures, p. 2.

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17. The Council on the Environment of New York City, From Farm to City (New Brunswick: Rutgers University, Cook College; 1980), p. 2.

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P. Hardigree, The Edible Indoor Garden, (New York: St. Martin's Press, 1980).

L. Hill, Successful Cold-Climate Gardening, (Brattleboro: Stephen Greene Press, 1981).

B. C. Moment, The Salad-Green Gardener, (Boston: Houghton Mifflin Co., 1977).

D. Wallace, Getting the Most From Your Garden, (Emmaus: Rodale Press, 1980).

R. Wolf, Solar Growing Frame, (Emmaus: Rodale Press, 1980).

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22. "Soil Erosion Means Dollars Down the Drain," Lancaster Farming, 25 July 1981.

23. "Soil Tests, Manure Application, and Legumes," p. 1.

24. "What's Ahead for Agricultural Research?," Countryside, April 1982, p. 28.

25. Telephone interview with L. L. Wilson, Professor of Animal Science, Pennsylvania State University, March 1982.

26. Eichers, p. 14.

27. Eichers, pp. 14-18.

28. Donald O. Cunnion, "Agricultural Marketing in the Northeast," p. 8, 785 Cressman Rd., Harleysville, PA 19438.

29. Larry Johnson, "Farms of Future Self-Sufficient," The Bismarck Tribune, 20 February 1982.

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31. Telephone interview with George Perry, Schuykill County Agricultural Extension Agent, March 1982.

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47. "What's Ahead for Agricultural Research?"

48. "What's Ahead for Agricultural Research?"

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8. For examples of fixed and sliding scale zoning, contact York County Planning Commission and Lancaster County Planning Commission.
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22. Bucks County Planning Commission, "Act 515".

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PENNSYLVANIA FOOD IMPORTS

Pennsylvania agriculture has a lot going for it. Pennsylvania ranks first in the nation for mushroom production, fourth for peaches and fifth for apples. Pennsylvania has over 4 million acres of prime farmland on which a wide variety of foods can be raised. Despite this bounty, 71 percent of Pennsylvania's food must be imported, much of it from the other end of the country. Pennsylvanians spend over $8 billion annually for food produced outside the state.

However, Pennsylvania has a great potential for expanding its food production. Most of the fruits and vegetables and much more of the meat Pennsylvanians consume could be produced in state. In addition to producing more food, other steps need to be taken, including encouraging local markets, maintaining the farm resource base, and expanding consumer awareness.

footnotes

a. Production figures are taken from the Pennsylvania Crop and Livestock Annual Summary 1980 and converted to retail weight by U.S. Department of Agriculture (USDA) conversion factors. For the fresh vegetables not surveyed by the PA Crop Reporting Service, Dr. Peter Ferretti, Department of Horticulture, Pennsylvania State University, provided the only estimates available.

b Prices were obtained from: Livestock and Meat Statistics #522, USDA; A & P, Allentown; Real Foods, Allentown; Ron Holding Corporation and Tom Goldschmidt, G & G Produce, Farmer's Market, Allentown Fair Grounds; Bureau of Labor Statistics. January, 1982 prices were converted to 1980 prices by obtaining the purchasing power of the 1980 U.S. dollar, Bureau of Labor Statistics. Prices may be higher due to out-of-season commodities.

c. Farmer-to-Consumer Direct Marketing in Six States, USDA, Economics and Statistics Cooperative Service (ESCS), July 1980.

d. Pennsylvania consumption is based on U.S. per capita consumption figures appearing in Food Consumption Prices and Expenditures, USDA Statistical Bulletin No. 672, 1981.

e Acreage requirements based on 90-95 percent marginal land unsuitable for crops, Dr. Lowell Wilson, Dairy and Animal Science, Pennsylvania State University.

f Veal is a by-product of the dairy industry, so land area would be included in dairy products.

g Land requirements, Mr. Lou Moore, Agricultural Economics, Pennsylvania State University.

h Land requirements, Mr. Herbert Jordan, Poultry Science, Pennsylvania State University.

i 354,250,000 dozen.

j Aquaculture: Catfish and Trout, Inventory and Sales, USDA Crop Reporting Board, ESCS, April 1981.

k Extrapolated from yields of 100 lbs. in 1/385th acre in an intensive recirculated fish culture unit, Steve Van Gorder, Rodale Research Center.

l Dairy product land requirements, Dr. Richard Adams, Dairy and Animal Science, Pennsylvania State University.

m 79,939,000 gallons.

n Data not collected by USDA, PA Department of Agriculture, or other sources.

o Not applicable.

p Production figures are generous, assuming no loss or waste between producer and consumer.

q Yield per acre determined from Knott's Handbook for Vegetable Growers, Oscar A. Lorenz and Donald N. Mayard, 1980, John Wiley and Sons, Inc.

r 1980 per capita consumption taken from American Mushroom Institute, Kennett Square, Pennsylvania.

s. 1980 per capita consumption taken from Vegetable Outlook and Situation Report, July 1981, Economic Research Service, USDA.

t Includes zucchini, field and chick peas, kidney and baked beans. Price used for retail value are an average of these vegetables.

u Pennsylvania 1978 Orchard and Vineyard Survey, PA Crop Reporting Service.

v Land requirements taken from Vegetables 1980 Annual Summary: Acreage, Yield, Production, Value, USDA Crop Reporting Board, Economic and Statistics Service, released June 5, 1981. Data is preliminary and subject to revision.

w Personal communication. Ray Reiter, Marketing Service Division, PA Department of Agriculture.

x Pennsylvania has no processing plants, so all soybeans would be exported. Dr. Elwood Hatley, Department of Agronomy, Pennsylvania State University.

y Flour.

z Lard is a by-product of hog slaughter.

* Using sugar beets as raw material, with yields of 20 tons/acre.

Cider, jelly, jams, etc.

+ Tomatoes, sweet corn, and snap beans are grown for processing as well as for fresh market, so any amount not considered in the fresh category would be utilized in processing.

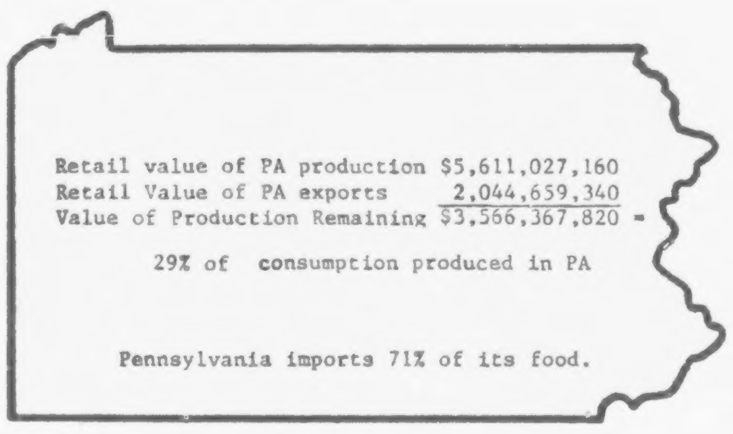
± Some grain and vegetable yields per acre were determined from Agricultural Statistics, 1980, USDA.

Prepared by: The Cornucopia Project, RODALE PRESS, INC. E. Minor St., Emmaus, PA 18049

Pennsylvania Food Imports

AS DETERMINED BY FOOD PRODUCTION AND CONSUMPTION BY WEIGHT AND RETAIL VALUE

COMMODITY	PRODUCTION (Total Fresh & Processed)			CONSUMPTION						
	Retail Weight (1,000 lbs)[a]	Retail Value ($1,000)[b] 1980 Dollars	Direct Market $ Value of Sales[c] (1,000)	Consumption in PA[d] (1,000 lbs.)	Retail Value ($1,000 - 1980)	% Imported	Amount Imported ($1,000)	Amount Exported (% of Production)	Retail Value of Amount Exported ($1,000)	Amount of Land Required to Produce 100% of PA Consumption (Acres)[f]
Meats										
Beef	207,194.37	483,384.47		907,825.3	2,115,233.42	77.2	1,632,960.2			7,269,866.6[e]
Veal	18,864.9	57,915.24		17,800.5	54,647.54			5.6	3,243.25	[f]
Lamb and Mutton	2,725.24	6,815.09		15,427.1	38,567.75	82.3	31,741.26			5,696.0
Pork	138,645.0	180,238.5		810,516.1	1,053,670.93	82.9	873,493.20			1,180,544.0[g]
Poultry										
Chicken	321,272.64	171,353.76		593,350.0	316,469.16	45.9	145,259.34			343,898.3[h]
Turkey	74,936.0	53,516.3		124,603.5	88,986.14	39.9	35,503.75			107,091.2[h]
Eggs	554,991.67[i]	371,267.23		410,598.2	274,673.77			26.0	96,529.48	268,324.1
Livestock, Poultry, and Products			8,775.17							
Fish	750.6[j]	2,191.69		150,710.9	440,063.77	99.6	438,303.52			6,524.3
Dairy Products			27,042.62							
Butter	59,172.0	105,378.23		52,214.8	92,988.3			11.8	12,434.63	188,860.9
Cheese: Hard	101,262.0	273,707.14		208,859.2	564,538.06	51.5	290,737.1			345,834.4
Cottage and Creamed	101,062.0	118,768.06		53,401.5	62,757.44			47.2	56,058.53	440,685.4
Evaporated and Condensed Milk	100,844.0	90,251.35		84,255.7	75,405.48			16.4	14,801.22	29,981.0
Fluid Milk and Cream	8,496,000.0	1,920,096.0		2,966,750.0	670,485.5			65.0	1,249,610.5	3,724,754.6
Frozen Dairy Products	319,756.0[m]	287,614.13		312,102.1	280,729.6			2.4	6,903.74	281,204.0
Dry Milk Products	48,301.0	99,990.8		80,695.6	167,052.8	40.2	67,155.23			102,496.9
Vegetables, Fresh										
Artichokes	NC[n]			3,560.1	4,795.31					NA[o]
Asparagus	819.0[p]	1,399.31	41.94	3,560.1	6,082.64	77.0	4,683.64			1,186.7
Broccoli	3,128.0[q]	3,082.21		20,173.9	19,878.56	84.5	16,797.38			2,373.4
Cabbage, Summer & Fall	35,619.0	9.337.88	194.47	99,682.8	26,132.84	64.3	16,803.42			8,038.9
Carrots	8,875.5	3,129.15		72,388.7	25,521.36	87.8	22,407.75			2,373.4
Cauliflower	4,186.0	6,016.79		15,427.1	22,174.3	72.9	16,165.06			1,101.9
Celery	11,160.0	9,987.75		86,629.1	77,529.58	87.1	67,528.26			1,443.8
Cucumbers	7,084.0	5,699.50	163.77	47,468.0	38,190.85	85.1	32,500.42			2,157.6
Eggplant	2,610.0	1,392.07		5,933.5	3,164.69	56.0	1,772.28			509.2
Escarole	NC			7,120.2	5,728.63					519.7
Garlic	NC			9,493.6	30,037.75					[illegible]
Green Peppers	7,084.0	6.339.9	127.11	39,161.1	35,047.62	82.0	28,739.95			3,560.1
Lettuce	2,297.1	2,055.81		295,488.3	264,450.21	99.3	262,599.06			11,963.30
Minor Vegetables	NC			121,043.4	103,952.07					NC
Mushrooms	213,709.0	191,261.01		140,003.06	12,463.20			93.5	178,829.04	NA
Onions	10,264.8	3,618.96		121,043.4	42,675.06	91.5	39,047.68			3,879.6
Peas	5,320.0	4,280.26		39,161.1	31,507.45	86.4	27,222.44			9,790.3
Potatoes	401,280.0	210,399.13	731.57	585,043.1	306,749.8	31.4	96,319.44			30,791.7
Snap Beans, Summer	9,306.0	13,291.95	170.14	15,427.1	22,034.84			+		5,142.4
Spinach	3,923.04	4,894.07		8,306.9	10,363.02	52.8	5,471.68			559.0
Squash	120,000.0	64,003.2	116.13	NC						NC
Sweet Corn	71,116.0	17,615.15	2,267.24	78,322.2	19,400.1			+		16,317.1
Sweet Potatoes	insignificant			40,347.8	21,519.90	99.9	21,498.38			3,502.9
Tomatoes	38,760.0	72,640.84	679.61	135,283.8	96,614.28			+		11,273.7
Vegetables, Processed										
Asparagus, frozen	NC			712.02	2,304.32					455.7
canned	NC			3,560.1	6,629.76					1,447.8
Beets, canned	NC			14,240.4	4,248.2					641.4
Broccoli, frozen	NC			16,613.8	16,370.57					2,599.6
Brussel Sprouts, frozen	NC			2,966.75	2,145.55					281.8
Carrots, frozen	NC			11,036.0	7,781.70					658.5
canned	NC			5,933.5	2,306.47					259.3
Cauliflower, frozen	NC			5,458.82	5,477.6					557.6
Corn, frozen	NC			22,903.31	17,598.9					11,969.2
canned	NC			[illegible]	30,488.32					24,673.3
Lima Beans, frozen	NC			5,577.49	5,798.36					2,252.5
canned	NC			3,560.1	1,770.08					855.8
Onions, dehydrated	NC			30,854.2	187,435.56					NA
frozen	NC			8,069.56	6,200.65					310.4
Peas, frozen	NC			18,275.18	13,712.23					5,926.8
canned	NC			39,161.1	13,452.62					8,610.6
Pickles, canned	NC			81,882.3	50,334.69					2,769.1
Potatoes, frozen	NC			269,380.9	182,640.25					35,444.9
canned	NC			15,427.1	4,602.21					1,276.4
Pumpkin and Squash, canned	NC			4,746.8	1,931.0					321.6
Sauerkraut	NC			14,240.4	4,505.66					543.4
Snap Beans, frozen	NC			11,867.0	9,011.33					4,517.1
canned	NC			73,575.4	29,930.47					16,898.6
Southern Greens, frozen	NC			10,680.3	8,110.19					710.2
Spinach, frozen	NC			8,900.25	5,873.45					856.5
canned	NC			5,933.5	2,681.94					359.8
Sweet Potatoes	NC			11,867.0	8,474.94					1,333.2
Tomatoes, Whole-canned	NC			72,388.7	32,065.3					4,731.5
Tomatoes Pulp and Puree-canned	NC			9,493.6	4,033.64					1,297.4
Catsup, Paste, Sauce, etc. canned	NC			143,590.7	79,181.66					14,848.6
Tomato and Vegetable Juices canned	NC			37,974.4	16,306.21					2,443.5
Other, canned	NC			10,680.3	5,117.15[t]					NA
Fruits, Fresh										
Apples	547,200.0	390,788.35	5,875.23	189,872.0	135,598.99			65.3	255,184.79	10,945.5[r]
Bananas	-0-	-0-		246,833.6	98,180.53	100.0	98,180.53			NA
Cherries, tart	5,152.0	8,802.50		NC						2,543.6
sweet	1,288.0	2,206.63	316.84	7,120.2	12,165.29	82.0	9,975.54			2,775.4
Citrus: Grapefruit	-0-	-0-		92,562.6	27,613.27	100.0	27,613.27			NA
Lemons/Limes	-0-	-0-		27,294.1	19,492.35	100.0	19,492.35			NA
Oranges/Tangerines Tangelos	-0-	-0-		210,045.59	56,964.45	100.0	56,964.45			NA
Grapes	101,920.0	82,000.76	132.47	42,721.2	34,371.77			58.0	47,628.99	5,443.6
Melons	NC		407.81	200,552.3	65,267.74	99.8	65,137.21			12,565.3[v]
Peaches/Nectarines	98,763.0	115,099.99	2,376.90	83,069.0	96,871.75			15.8	18,185.8	7,738.9
Pears	6,650.0	2,344.52	305.47	28,480.8	10,041.19	76.7	7,701.59			6,103.0
Plums and Prunes	NC		89.33	17,800.5	20,758.23	99.5	20,654.44			2,433.8
Strawberries	5,704.0	13,303.55	2,312.72	20,173.9	47,051.99	71.8	33,783.33			4,880.8[w]
Fruits, Processed			117.03[u]							
Frozen Fruits	NC			32,871.59	34,173.30					
Frozen Citrus Juices	NC			117,483.3	156,121.21					
Canned and Chilled Fruits	NC			206,485.8	126,930.95					
Canned and Chilled Fruit Juices	NC			274,483.71	117,863.31					
Dried Fruits	NC			34,888.98	86,418.61					
Grains and Legumes										
Barley	insignificant			14,240.4	8,882.59	100.0	8,882.59			8,376.2
Corn Flour and Meal	243,037.97	87,882.53		89,002.5	32,183.30			63.4	55,717.53	37,499.7
Corn Cereal	NC			75,948.8	67,477.66					
Corn Starc	NC			22,547.3	13,248.79					
Oats	insignificant			36,787.7	26,272.30	100.0	26,272.30			35,506.7
Rice	-0-	-0-		110,363.1	45,893.39	100.0	45,893.39			NA
Rye	insignificant			8,306.9	2,027.55	100.0	2,027.55			6,860.9
Soybeans (oil)	27,758.95	42,409.02		NC				100.0[x]	42,409.02	NA
Wheat	108,586.96	27,485.53		1,382,505.5	349,939.79	92.1	322,294.55			859,395.3
Wheat Cereal	NC			33,227.6	32,440.77					
Dry Edible Beans	NC			77,135.5	60,665.53					64,279.6
Dry Field Peas	NC			4,746.8	2,162.64					3,166.6
Fats and Oils										
Lard	41,081.90	25,625.25		29,667.5	18,505.4			27.8	7,123.82	
Margerine	NC			132,910.4	94,919.29					
Shortening	NC			217,166.1	125,643.62					
Other Edible Fats and Oils	NC			269,380.9	228,909.11					
Sweeteners										
Cane and Beet Sugar	-0-	-0-		992,081.2	627,788.98	100.0	627,788.98			202,384.6*
Honey	3,280.0	3,825.6		14,240.4	16,606.58	77.0	12,787.07			
Maple Syrup (gal.)	56,000.	1,288.38		1,186.7	2,478.14	47.9	1,187.03			
Syrups (Corn)	NC			575,549.5	364,207.72					
Honey & Syrups			238.95							
Other										
Coffee	-0-	-0-		92,562.6	365,666.7	100.0	365,666.7			NA
Tea	-0-	-0-		9,493.6	25,660.82	100.0	25,660.82			NA
Cocoa	-0-	-0-		30,854.2	54,947.63	100.0	54,947.63			NA
Tree Nuts	NC			20,173.9	32,644.6					NC
Peanuts	-0-	-0-		72,388.7	101,431.05	100.0	101,431.05			NA
TOTALS	12,692,678.64	5,611,027.16	52,482.52	15,838,765.92	12,137,234.29		6,109,053.91		2,044,659.34	15,835,525.0



Retail value of PA production $5,611,027,160
Retail Value of PA exports 2,044,659,340
Value of Production Remaining $3,566,367,820 =

29% of consumption produced in PA

Pennsylvania imports 71% of its food.

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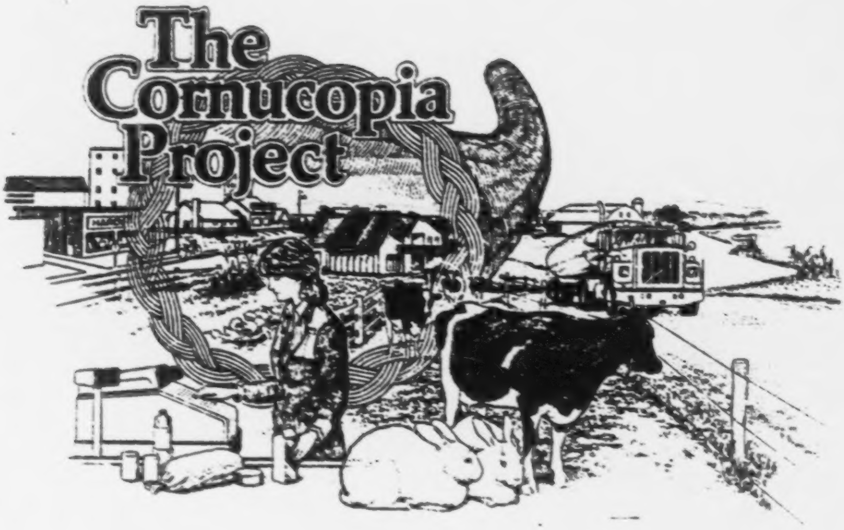
THE KANSAS FOOD SYSTEM: ANALYSIS AND ACTION TOWARD SUSTAINABILITY



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1982

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This study was funded in part by the Jessie Smith Noyes Foundation, Inc.

TABLE OF CONTENTS

Preface 1
Introduction 2
Kansas Food Production 3
Fruit Production 35
Consumption of Food in Kansas 39
Negative Impact of Current Production Practices 42
The Farmer: An Endangered Species? 56
Goals of the Kansas Food System 61
Actions Toward Sustainability 63
What We Can Do--Consumers 63
What We Can Do--Famers 65
What We Can Do--Agri-business and the Food Industry 67
What We Can Do--State Government 67
Other State Legislation 70
Conclusion 74
Footnotes 75
Appendix 1: Kansas Food Imports Chart 84
Appendix 2: Grains and Miscellaneous Food Crop, Production and Use 92
Appendix 3: Kansas Food System Organizations 93

CHARTS AND GRAPHS

Figure A: Kansas' Rank in U.S. Agriculture - 1980 3
Figure B: Cash Receipts, 1979 3
Figure C: General Prime Farmlands Map 7
Figure D: Normal Annual Precipitation for Kansas 1941-1970 . . . 8
Figure E: Average Annual Streamflow in Kansas 8
Figure F: Irrigated Acres Map 9
Figure G: Wheat Production, 1980 13
Figure H: Patterns of Wheat Flows to Domestic Destinations in 1977 13
Figure I: Corn Grain Production, 1980 17

Table of Contents (continued)

Figure J: Sorghum Grain Production, 1980 17

Figure K: All Cattle and Calves, January 1, 1981 22

Figure L: Grain Utilization for Beef 6

Figure M: All Hogs and Pigs, December 1, 1980 29

Figure N: Milk Production, 1980 29

Figure O: Egg Production, 1980 31

Figure P: Selected Vegetable Production 33

Figure Q: Fruit, 1916-1980 36

Figure R: Income Multipliers: Ratio of Initial Income Effect to Total Income Effect 41

Figure S: Irrigation By County 46

Figure T: Distribution of Water Withdrawals 1965-1975 46

Figure U: Estimated Water Level Declines, 1950-1975 47

Figure V: Average Annual Water Level Change in Feet In Grant County 49

Figure W: Hydrograph for Observation Wells 49

Figure X: Projected Water Requirements 51

Figure Y: Kansas State Water Plan Studies, Phase II 51

PREFACE

This analysis of the Kansas food system looks at what is produced and consumed within our state and how agriculture impacts our environment and natural resources. The material present was collected with help from the Kansas State Board of Agriculture, Kansas State University, various state agencies, and with help from the staff at The Cornucopia Project of Rodale Press, the Kansas Rural Center, and the Lawrence Appropriate Technology Center.

The Kansas Food System is only the beginning of the analysis that is needed to fully evaluate our state's agriculture and food needs. It is intended to provide a larger perspective of the food system of Kansas and to plant the seeds for a healthy discussion of the future agriculture and food needs of Kansas. This study concludes with actions we can take as consumers, producers, agri-businesses, and as determiners of state government policies to create a more sustainable Kansas food system.

INTRODUCTION

Kansas is the breadbasket of the United States where extensive fields of golden grain ripen in the summer breezes. Kansas leads all states in the production of wheat which fills our nation's breadbasket and ranked first in 1980 wheat exports, sorghum silage production, and commercial grain storage capacity; second in cropland, sorghum grain production, flour milled, and dehydrated alfalfa production; fourth in cattle and calves produced and fifth in the value of farm crops (see figure A).

Although our state's agricultural productivity is impressive, our whole food system--production, consumption, and how it impacts the people and environment of Kansas--needs to be carefully analyzed to ensure a sustainable and productive Kansas food system. When the future of our food system is considered, the following discoveries should be of immediate concern:

* Between 1930 and 1980, Kansas lost 56 percent of its farms.
* Farm size increased 236 percent during this time period.
* Multi-national corporations own the two largest beef feedlots in the state and control over half of the egg production.
* The Soil Conservation Service reports that 54 percent of Kansas cropland needs additional conservation treatment.
* 6.8 million acres of Kansas cropland (14 percent of total) are losing more than 10 tons of soil per acre per year.
* Extensive areas of western Kansas have depleted over 25 percent of the Ogallala Aquifer; several areas are over 50 percent depleted.
* Commercial vegetable acreage declined 87 percent since 1930 to only 7,200 acres in 1980.
* In 1978 over 18.5 million pounds of pesticides, or 7.87 pounds per person, were used to produce Kansas' top five crops.
* Agricultural operations killed 112,000 fish (59 percent of all causes) in 1981; feedlots killed 85,000 and pesticides killed 25,000.

Figure A

Kansas Farm Facts

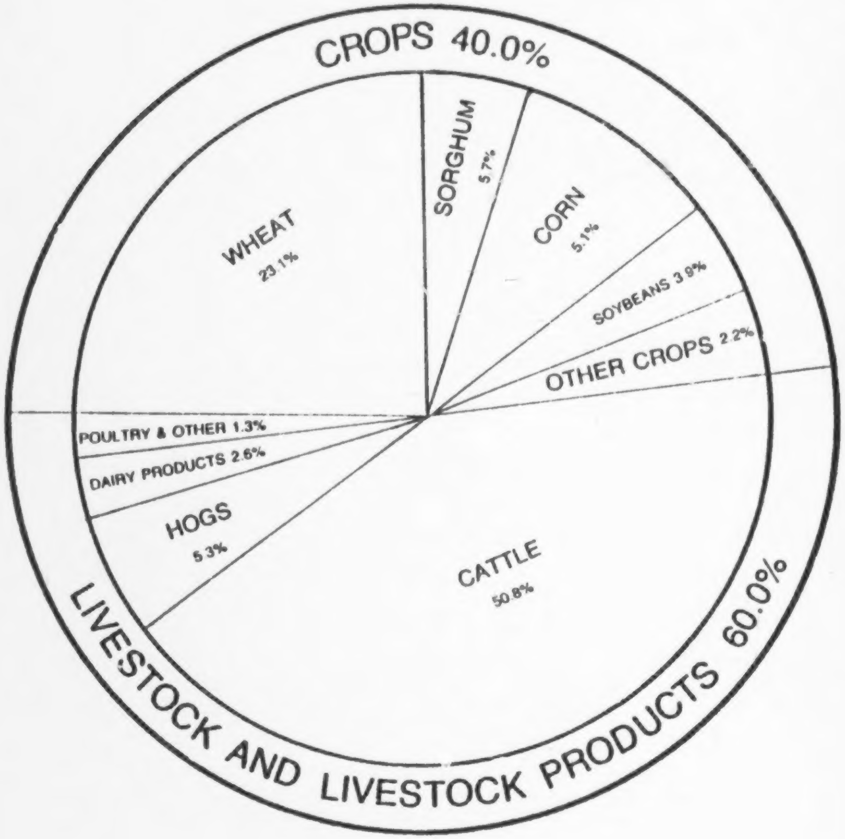
KANSAS' RANK IN U. S. AGRICULTURE—1980

Crop or Livestock Item	Production or number	Rank	% of U.S. Produced on Kansas Farms
Wheat (all) produced	420,000,000 bu.	1	17.7
Sorghum silage produced	2,745,000 tons	1	38.6
Commercial grain storage capacity January 1, 1981	848,000,000 bu.	1	11.8
Sorghum grain produced	156,520,000 bu.	2	26.6
Flour milled	32,785,000 cwt.	2	11.6
Motor trucks on farms	157,500 number	2	5.2
Cropland[1]	30,019,593 acres	2	6.5
Grain drills on farms	67,200 number	2	6.5
Dehydrated alfalfa processed	146,800 tons	2	——
Combines on farms	40,200 number	3	7.6
Land in farms	48,300,000 acres	3	4.6
Lespedeza seed produced	650,000 lbs.	3	12.1
All cattle and calves produced	2,776,030,000 lbs.	4	6.9
Cattle and calves on grain feed January 1, 1981	1,100,000 head	4	9.9
All cattle and calves on farms January 1, 1981	6,450,000 head	4	5.6
Red meat production by commercial slaughter plants	2,251,699,000 lbs.	4	5.8
Tall fescue seed	2,550,000 lbs.	5	3.2
Exports of farm products	2,214,900,000 dollars	5	5.5
Alfalfa seed produced	6,400,000 lbs.	6	6.3
Cash receipts from farm marketing	5,941,100,000 dollars	7	4.3
Sheep and lambs on feed January 1, 1981	60,000 head	8	3.7
Hogs produced	777,883,000 lbs.	8	3.3
Corn silage produced	3,834,000 tons	8	3.5
Popcorn produced	8,990,000 lbs.	9	1.7
Alfalfa hay produced	2,850,000 tons	10	3.6
Hogs on farms December 1, 1980	1,900,000 head	10	2.9
All hay produced	4,230,000 tons	10	3.2
Wheel and crawler tractors on farms	149,300 number	10	3.5
Corn grain produced	116,560,000 bu.	11	1.8
Field forage harvesters on farms	11,400 number	11	3.4
Dry edible beans	336,000 cwt.	11	1.3
All other hay (all excluding alfalfa)	1,380,000 tons	13	2.7
Sugar beets produced	202,000 tons	13T	.9
Red clover seed produced	450,000 lbs.	14	1.8
All sheep and lambs produced	14,089,000 lbs.	16	1.9
Soybeans produced	23,925,000 bu.	17	1.3
All sheep and lambs on farms January 1, 1981	200,000 head	17	1.5
Barley produced	2,419,000 bu.	17	.7
Rye produced	210,000 bu.	19	1.3
Milk produced	1,355,000,000 lbs.	24	1.1
Farm chickens produced	6,952,000 lbs.	31	.6
Eggs produced	427,000,000 number	32	.6

[1] Total cropland, 1978 U. S. Census of Agriculture

Figure B

CASH RECEIPTS, 1979



Source: 64th Annual Report and Farm Facts 1980 (Topeka: Kansas State Board of Agriculture, 1980)

- Over 36,000 acres of prime farmland are lost each year due to urban sprawl and other non-farm uses.

- Kansas imports over $772 million of food per year or $328 per person in 1980.

Agriculture is considered the largest and most important industry in Kansas. In 1979, Kansas farmers' cash receipts totaled $5.9 billion (see figure B), of which $3.5 billion was from livestock (ranking Kansas sixth nationally) and $2.4 was from crops (ranking Kansas twelfth).[1] Kansas is a bountiful grainary, feeding grains to ourselves, to livestock, and to others across the country and around the world. However, production of crops as currently practiced in Kansas is not sustainable into the future, family farms are in decline, our state is being urbanized, and all of these are accompanied by environmental deterioration.

The negative impacts of our current agriculture practices have been accelerated by the rapid industrialization of our state's agriculture and economy since World War II. This has resulted in centralization and specialization, people moving from rural to urban areas, and self-reliance being replaced by inter-regional dependence. While these developments have been seen as desirable in the past, the negative impacts that they created indicate that Kansas has become overly dependent upon centralized production and distribution systems which in the future may not prove to be sustainable.

When Kansas was first described on maps, it was called part of the Great American Desert. Major Stephen H. Long, a U.S. Topographical Engineer, declared in 1819 that the central American plains which included most of Kansas as:

> "almost wholly unfit for cultivation, and of course uninhabitable by a people depending upon agriculture for their subsistence. Although tracts of fertile land considerable extensive are occasionally to be met with, yet the scarcity of wood and water, almost uniformily prevalent, will prove an insuperable obstacle in the way of settling the country."[2]

Other early explorers of this prairie bio-region such as Coronado, Pike, and even Lewis and Clark had similar perceptions. None of them recognized the actual potential of this area for growing grasses--both the native grasses and the ones we now cultivate. Their perceptions were limited by the dominant cultural and economic values of their time.

The Great American Desert has been transformed into an important agricultural region. But like Long and these early explorers, our perceptions of the land we now call Kansas are limited to the dominant cultural and economic values of our time and it is sometimes difficult for us to see what we are doing to our resource base and the beauty of our land, water, and environment.

The land of Kansas may be on the verge of another transformation. The pioneers who broke the prairie sod are a recent memory. The miners of soil and groundwater who followed are still with us. They are guided by our economic system and sophisticated technology. But these activities, by choice or necessity, will change. We have the potential to creatively transform Kansas into a region that has a sustainable food system: one that is productive, diverse, self-reliant, and over time could almost become indigenous--as the prairie was.

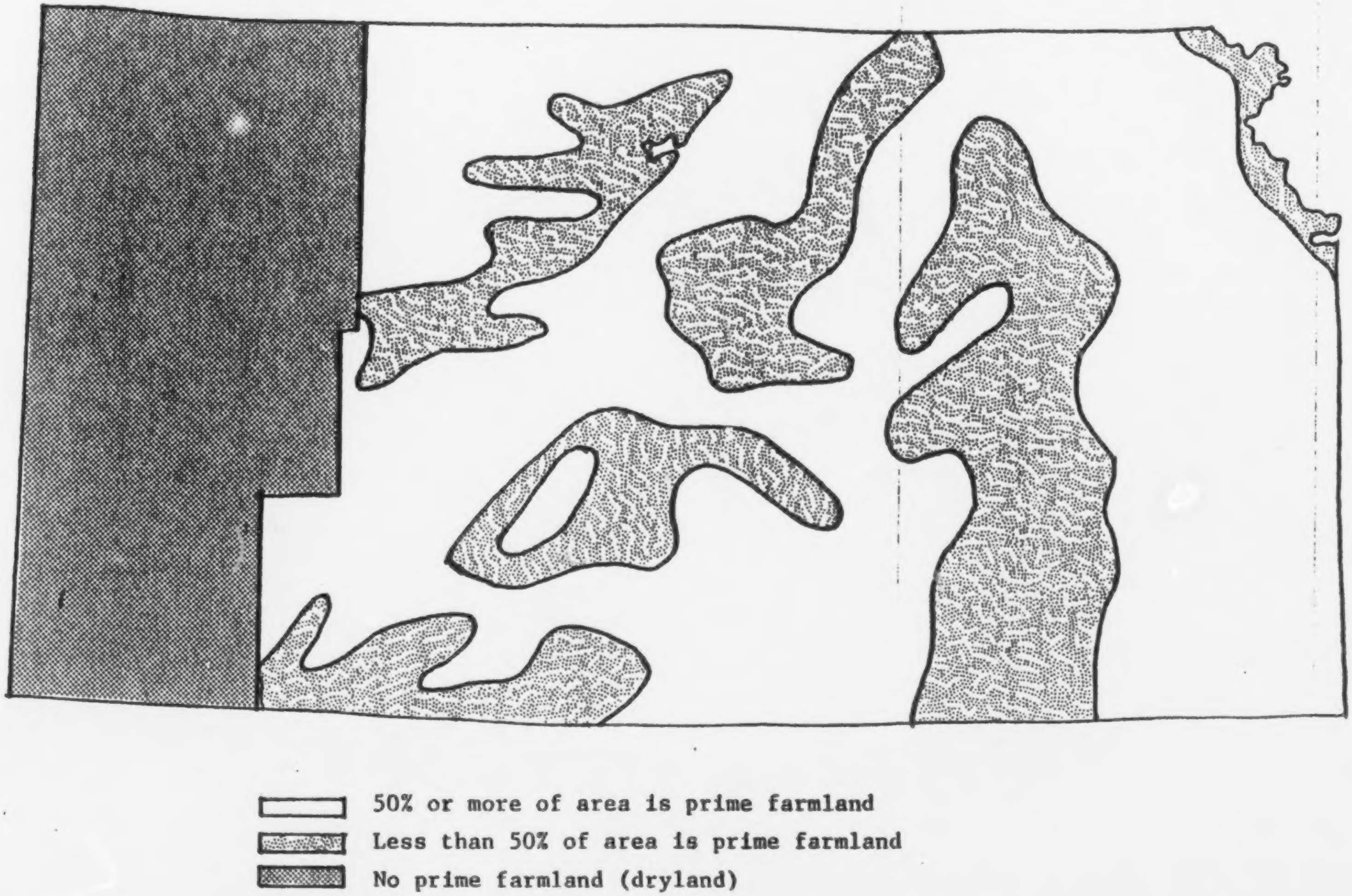
Kansas is located in the heart of the prairie bio-region and the center of the contiguous 48 states of the United States. It is an area of rolling plains with a total area of 82,262 square miles or 52,647,680 acres. The prairies and wind-blown materials (loess) endow Kansas with some of the most productive soils in the world. Farming accounts for the greatest use of land resources, 49,278,000 acres, nearly 94 percent of the state's total land area.[3] There are over 27.3 million acres of prime farmland in Kansas, 7.9 percent of the national total, excluding Alaska. Of the total land surface of Kansas, over half (51.8 percent) is prime farmland.[4] Our state has more cropland than any other state except Texas[5] and this resource can guarantee future prosperity for the state if we use and manage it wisely (see figure C).

Overall, Kansas climate is considered to be subhumid. The growing season varies from 150 days in the northwest to 200 days in the southeast. Rainfall averages 40 inches in the extreme eastern part of the state to 15 inches in the far west (see figure D), but in any year it can vary widely from the norm. Fortunately for crop production, 70 to 80 percent of the average rainfall falls during the growing season, from April to September.[6]

Due to the rainfall patterns and the resulting runoff, eastern Kansas has more and bigger streams than western Kansas and about 12 million acre-feet of water flow out of the state each year[7] (see figure E). An acre-foot is that amount of water which would cover one acre to a depth of one foot, or 326,000 gallons. Kansas has more than 250 million acre-feet of water stored underground.[8] Most of this water underlies western Kansas in areas where the underground material is sand and gravel which can hold large amounts of water (see figure F). Irrigation wells dot western Kansas. In most areas of intensive irrigation, water is being withdrawn at a much faster rate than it can naturally recharge itself through the process of rainfall percolating down to the underground aquifer. The water table, actually the saturated thickness of the material below, is declining in these areas, creating serious problems and concerns for the future.

Figure C

GENERAL PRIME FARMLANDS MAP
KANSAS

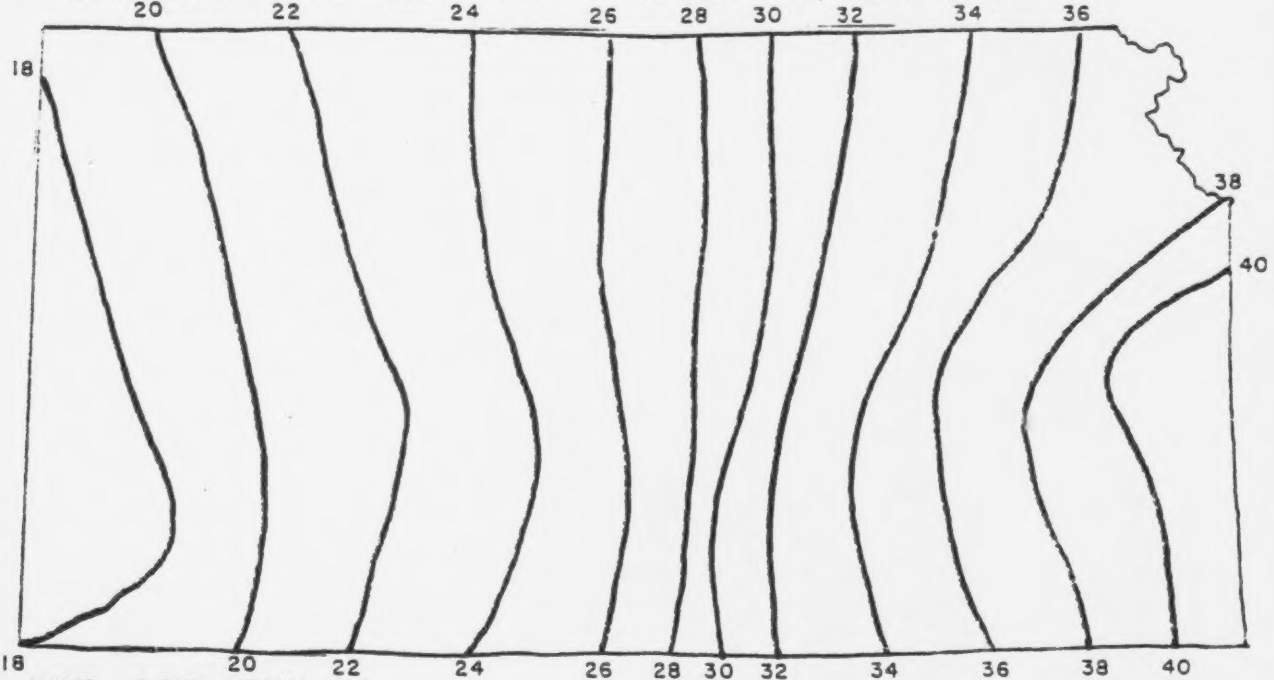

☐ 50% or more of area is prime farmland
▨ Less than 50% of area is prime farmland
▩ No prime farmland (dryland)

Source: Family of Maps S.C.S Drwg.No.5,S-32,550 (REV. 1-76), and information from SCS Field Personnel.

Albers Equal Area Projection, USDA-SCS, Lincoln, Nebraska, 1980.

Figure D

NORMAL ANNUAL PRECIPITATION FOR KANSAS, 1941-1970


20
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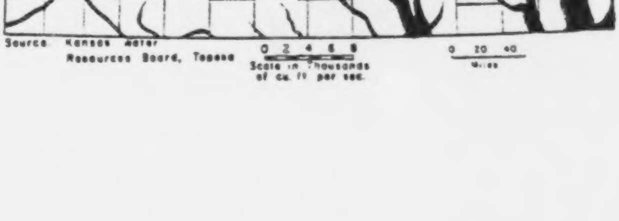
SOURCE: L. D. BARK, METEOROLOGIST
AGRICULTURAL EXPERIMENT STATION
KANSAS STATE UNIVERSITY

Precipitation in inches

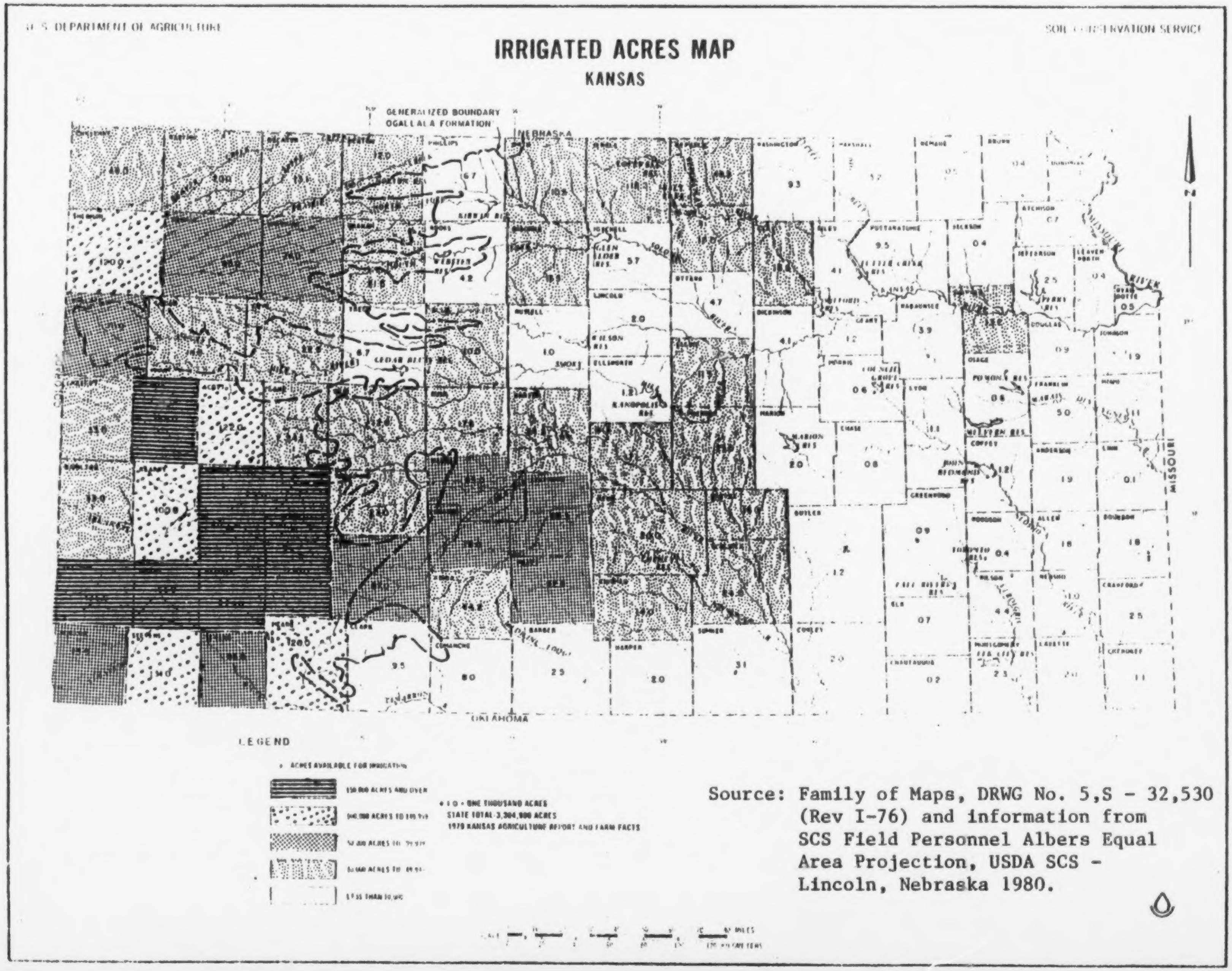
Figure E

AVERAGE ANNUAL STREAMFLOW IN KANSAS


0 2 4 6 8
Scale in Thousands of cu. ft per sec.
0 20 40
Miles

Source: Kansas Water Resources Board, Topeka

Figure F


U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
IRRIGATED ACRES MAP
KANSAS
GENERALIZED BOUNDARY OGALLALA FORMATION
NEBRASKA
OKLAHOMA
MISSOURI
LEGEND
• ACRES AVAILABLE FOR IRRIGATION
150,000 ACRES AND OVER
100,000 ACRES TO 149,999
50,000 ACRES TO 99,999
10,000 ACRES TO 49,999
LESS THAN 10,000
• 1.0 = ONE THOUSAND ACRES
STATE TOTAL 3,304,000 ACRES
1979 KANSAS AGRICULTURE REPORT AND FARM FACTS

Source: Family of Maps, DRWG No. 5,S - 32,530 (Rev I-76) and information from SCS Field Personnel Albers Equal Area Projection, USDA SCS - Lincoln, Nebraska 1980.

KANSAS FOOD PRODUCTION

Kansas is a leading producer of grains and meat for the United States and an important granary for the developed world. Production has increased tremendously since World War II as abundant and inexpensive sources of energy have allowed for highly mechanized farming operations, dramatic increases in agricultural chemicals, and irrigation. Chemical fertilizer has been the most important energy-intensive input for increasing Kansas food production. High crop yields in both dryland and irrigated acreages are dependent upon high levels of soil nitrogen which has recently been provided almost entirely through chemical fertilizers.

The Kansas Agricultural Experiment Station reported that Kansas farmers need continued access to moderately priced chemical fertilizers if they are to sustain high levels of production in the future.[9] We may not be able to continue our current level of production considering that our nitrogen fertilizer consumption (909,000 tons in 1980[10] which cost $180 million [11]) requires a tremendous amount of natural gas which is a limited resource and is expected to become more expensive.

Farms have become larger, increasing in size 236 percent since 1930, and averaging 664 acres in 1980.[12] These large farms have become extremely specialized with only five cultivated crop species--wheat, sorghum, corn, alfalfa, and soybeans--accounting for more than 95 percent of the value of harvested crops in Kansas.[13] And the majority of that production (about 58 percent) is used for livestock and another 39 percent is exported from Kansas for human consumption.[14]

Kansas can have a more diversified agriculture. In addition to our standard crops, farmers have at times successfully and profitably grown flax, castor beans, tobacco, cotton, hemp, broomcorn, cowpeas, oats, rye, barley, potatoes, sweet potatoes, apples, and peaches; and raised sheep, chickens, and turkeys. Some of these commodities are still grown in our state, but their importance has declined. Some farmers are now experimenting with sunflowers, rapeseed, and other speciality crops. Kansas State University is doing research on crops like pearl millet. Many of these crops may not be practical on large acreages, some are not currently as profitable as others, but all of them could be grown in parts of Kansas.

A comparison of two farms in Dickinson County, near Abilene, can highlight some changes in crop diversity that have occurred in central Kansas agriculture. A statistically average farm for 1881 in Dickinson county consisted of 160 acres, grew 50 acres of wheat, 36 acres of corn, one acre of potatoes, 3 or 4 acres of other crops, kept 4 horses or mules, 7 or 8 head of cattle, 12 hogs, 6 sheep, and had an orchard of 30 apple trees, 60 peach trees, 12 cherry trees, some plum and pear trees, and raspberry, gooseberry, and blackberry bushes, and some grape vines.[15]

In 1981, one century later, a statistically average Dickinson County farm had increased to 455 acres, had 161 acres of wheat, 47 acres of sorghum, 8 acres of corn, 15 acres of alfalfa, 15 acres of other hay, and 10 acres of other crops, kept 57 head of cattle, 21 hogs, 3 sheep, and 17 chickens.[16] No records are now kept on orchards and berry bushes, but they are probably insignificant. It should be noted that due to current production techniques with larger fields, the 1980 farm becomes more diversified through statist[illegible] han it actually is.

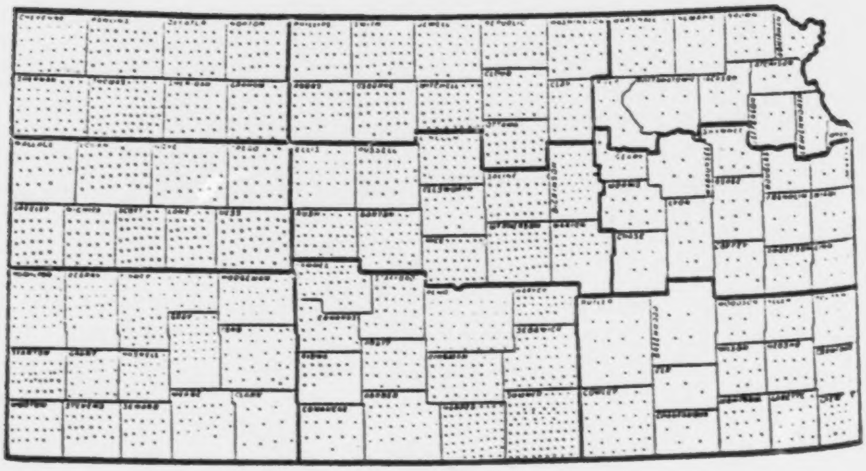
This comparison points out that a better diversified agriculture was and is possible. As the energy cost of our current food system increases and as local food production becomes more economically competitive, Kansas agriculture can diversify to meet more of our own needs. This is not to deny the fact that we have the capability of feeding others too. We can produce for both ourselves and others.

Wheat

Winter wheat is highly suited to the subhumid environment of Kansas. Planted in the fall, it makes rapid growth in the usually cool and moist spring and matures in the early heat of summer. Mennonite farmers introduced hard red winter wheat into Kansas in the late 1870's which helped set the stage for Kansas becoming the "Wheat State". In 1980 Kansas led the nation in wheat production with a record wheat crop of 420 million bushels, harvested from 12 million acres, and worth $1.6 billion to Kansas farmers (see figure G).

Wheat is important to human nutrition because it contains generous amounts of carbohydrates and certain vitamins and minerals. It is planted on more acres worldwide than any other grain. Wheat commands the leading price for cereal grains because of its human nutritional value. About 75 percent of the U.S. crop is used directly for human food. Only the flour milling by-products of bran, germ (the most nutritious part of a wheat kernel, and shorts which comprise about 25 percent of whole grain wheat, are fed to livestock.[17]

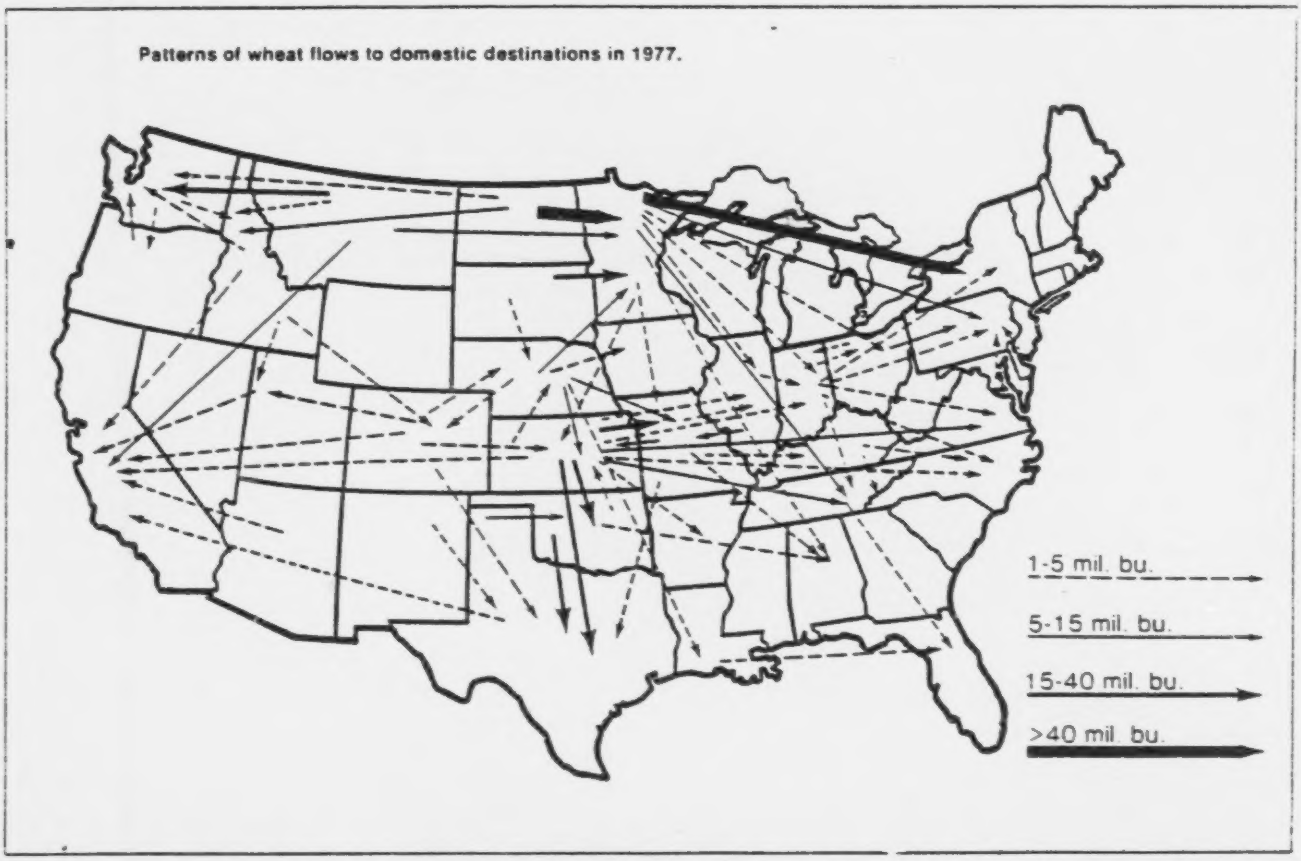
Figure G


WHEAT PRODUCTION, 1980

1 Dot=200,000 Bushels

Source: 64th Annual Report and Farm Facts 1980 (Topeka: Kansas State Board of Agriculture, 1980)

Figure H


Patterns of wheat flows to domestic destinations in 1977.

Source: Mack N. Leath, Lowell D. Hill, and Stephen W. Fuller, Wheat Movements in the United States (Champaign: University of Illinois Agricultural Experiment Station, 1980).

Wheat exports are important in the balance of payments for the U.S. and are a boon to the Kansas economy. Two out of three acres of wheat harvested in Kansas are destined for foreign export.[18] The slogan "a bushel of wheat for a barrel of oil" may be somewhat out of proportion, but is essentially what happens in U.S. world trade.

About 95 percent of the wheat grown in Kansas is shipped out of the state.[19] Most of it is shipped out as whole grain but some is also shipped out as flour (see figure H). Approximately one-fifth (or 82 million bushels) of the Kansas wheat crop is ground in Kansas mills.[20] Until the 1960's many mills were located in wheat production areas of the United States, but because advances in technology which altered the structure of transportation, new grain mills are now located closer to major consumption centers and away from Kansas.[21] Nonetheless, Kansas still leads the nation in milling capacity with 12,425,000 pounds per day.[22] In 1890 there were 400 flour mills in Kansas which produced 10 million barrels of flour per year,[23] now there are only 19 large mills left in Kansas. There has been substantial centralization in the milling industry nationwide, with the 10 largest companies controlling 71 percent of the industry's total wheat flour capacity.[24]

The average Kansan consumes 119 pounds of flour, bakery products, and wheat cereal per year.[25] This accounts for 274,000,000 pounds of wheat, only one percent of the 1980 Kansas crop. More wheat, approximately 780 million pounds or 3 percent of the wheat crop, is used for seed for the next crop.[26]

Kansas is the breadbasket for our country and the rich nations of the world. Along with the export of grain, we are also exporting our soil's fertility. This is returned for the most part by energy-expensive fertilizers. Also, during seed bed preparation, wheat production practices expose the soils to the erosive forces of wind and water. However, when compared to other crops, wheat has one of the most favorable energy input/output ratios of major crops grown. It requires only moderate amounts of fertilizer, no cultivation, and normally little pesticide use. Wheat production practices that are productive and sustainable are not only possible but necessary for our nation's breadbasket to remain full.

Corn

Corn was the first grain crop grown in Kansas and is the highest yielding, averaging 94 bushels per acre in 1980. Total production for 1980 was 116,560,000 bushels worth $396,304,000 to Kansas farmers.[27] Corn is an important feed grain for livestock—80.5 percent of the 1980 crop was fed to livestock.[28] Farmers grew an additional 426,000 acres of corn that was harvested for livestock feed as corn silage.

The increase in deep-well irrigation in the western part of Kansas has resulted in a shift of corn acreage to the West. In 1972, the first year that the Board of Agriculture kept statistics on irrigated corn acreage, 573,400 of the total 1,240,000 acres (46.2 percent) were irrigated.[29] This increased to 958,000 irrigated corn acres (77.3 percent) by 1980.[30] Most of this increase came in the western third of the state. Irrigated corn produces higher yields than dryland corn and by 1980, 77.3 percent of the entire Kansas crop came from irrigated acreages in the western third of the state.[31]

Paralleling the increase in corn production in western Kansas has been the rise of cattle feedlots and packing plants. This is offset by a sinking water table. Corn acreages have started to decline in western Kansas because more water-conserving crops, such as wheat and grain sorghum, are being planted when increased pumping costs make corn less profitable than these crops (see figure I).

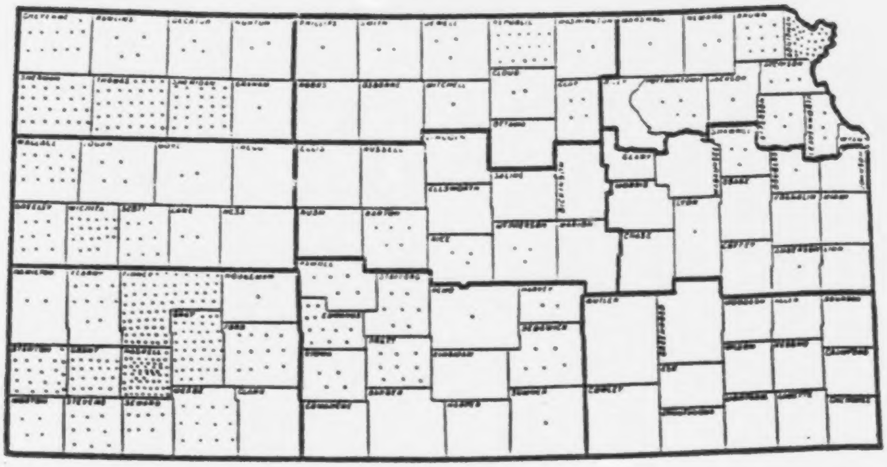
Corn requires more fertilizer per acre than any other grain crop grown in Kansas. This is necessary to obtain the highest potential yields. Corn is a row crop, and when planted on slopes, is highly susceptible to soil erosion. Of all crops grown in Kansas, corn has the largest percentage of its plant acreage treated for both weed and insect control. Of the 1.82 million acres of corn planted in 1978, 86 percent were treated for weed control and 81 percent were treated for insect control. A total of 6,463,000 pounds of herbicides and 2,627,000 pounds of insecticides were used on corn in 1978.[32]

Kansans each consume about 17.8 pounds of cornmeal, cereal, cornstarch and hominey grits per year, or 37 million pounds total.[33] However, this only accounts for 0.6 percent of the acreage planted in Kansas for the production of grain. There are two large cornmeal mills in the state which sell cornmeal nationally and internationally.

Grain Sorghum

Grain sorghum or milo is second to corn in value as a feed grain and was grown on more acres--3,640,000--than any other Kansas crop besides wheat[34] (see figure J). Kansas is second only to Texas in sorghum production and produced 31.5 percent of the U.S. crop in 1977.[35]

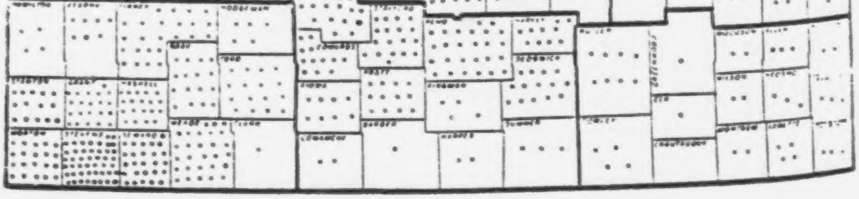
Figure I



CORN GRAIN PRODUCTION, 1980

1 Dot=200,000 Bushels

Figure J



SORGHUM GRAIN PRODUCTION, 1980

1 Dot=200,000 Bushels

'Source: 64th Annual Report and Farm Facts 1980 (Topeka: Kansas State Board of Agriculture, 1980)

In 1980, farmers produced 156,520,000 bushels with a farm value of $460,170,000. Grain sorghum is almost as high yielding as corn, but is much more drought tolerant. It is highly suited for the Great Plains climate with the states of Texas, Kansas, and Nebraska producing 80 percent of the U.S. crop.[36] Almost the entire production of grain sorghum is for livestock feed. It is fed to cattle in Kansas at about an equal rate to corn and large amounts are used in the feedlots of southwest Kansas. In 1980, beef cattle in Kansas consumed 78,826,000 bushels of grain sorghum or the equivalent of one out of every two acres harvested.[37] In addition, 760,000 acres of sorghum silage and forage were grown in 1980 and fed to livestock.[38] In 1977, about 40.7percent of the crop was shipped outside of the state to be fed elsewhere.[39] The foreign export accounted for 17.6 percent of the 1977 crop.[40]

Grain sorghum is a row crop like corn and is grown under similar production techniques. It can be grown further west than corn without irrigation, and requires less irrigation for high yields. Grain sorghum is commonly being grown on irrigated acreages of western Kansas. Because of its large acreage and the production techniques used, grain sorghum requires more pesticides than any other crop grown in Kansas. In 1978, 9,001,900 pounds of herbicides and 1,625,800 pounds of insecticides were used on sorghum acreages.[41]

Other Grains

Oats, barley, and rye are all grown in Kansas as minor crops. Their acreages have decreased since the 1940's as they are not normally as profitable or useful as wheat or feed grains. Almost all of their production is for livestock feed. If the direct human consumption of these grains were met by 1980 Kansas production, only 3.4 percent, 2.4 percent, and 1.4 percent of the current acreages of these grains (189,000 acres total) would be needed.[42]

Popcorn production for 1980 on 4,200 acres was 8,990,000 pounds.[43] Popcorn is produced entirely for human consumption, and Kansans consumed 2.5 pounds per person or 5,856,760 pounds in 1980.[44] Kansas ranked 9th in the nation in popcorn production and exported 30 percent of its crop.[45]

Beans

Soybeans are an important and valuable crop for Kansas. They are crushed for oil and the meal is used for livestock feed. In 1980, a low year for production, 1,450,000 acres of soybeans yielded 23,925,000 bushels worth $181,830,000 to Kansas farmers.[46] Soybeans are grown primarily in the eastern part of the state where rainfall is usually adequate, although some are grown in the central part of the state and some are irrigated in western Kansas. In 1980, the eastern third of Kansas had 85.2 percent of the soybean acreage harvested and 81.1 percent of the total yield.[47]

Most soybeans grown in Kansas are crushed for oil at four large processsing plants within the state. Oil extraction from soybeans is 17.9 percent and is used primarily as a vegetable oil in various forms for human consumption.[48] The remaining meal is very high in protein and is a valuable livestock feed supplement. There is also some soybean flour that is milled in Kansas for human consumption. Kansas per capita consumption of soybeans amounts to 2.0 pounds of soy flour per year and 22.7 pounds of oil per year.[49] Only 22 percent of the Kansas soybean acreage is needed to supply this demand.

Kansas livestock consumed the equivalent of 740,980 acres of soybeans in their feed rations for 1980.[50] This accounted for 51.1 percent of the total acreage. The remaining production of soybeans is shipped to other parts of the country as beans, oil, and feed, and some (about 8.6 percent in 1977[51]) is exported to foreign countries.

Soybeans are a legume, and with the help of rhizobium bacteria are able to supply their own nitrogen needs. They are usually grown as a row crop like corn. Soybeans have the least plant residue of all harvested crops, and their fields are the most subject to erosion. In 1978, about 78 percent of the 1.48 million acres of soybeans planted were treated with herbicides, while only 2 percent were treated with insecticides.[52]

Twenty-four thousand acres of dry beans, mainly pinto beans, were harvested in 1980, producing 33,600,000 pounds of beans.[53] They were grown on irrigated ground in western Kansas. Kansans consumed 15,311,000 pounds of dry beans in 1980[54] and 54.4 percent of the Kansas acreage is needed to produce this amount.

Alfalfa and other Hay

Alfalfa was grown on 1,000,000 acres and produced 2,850,000 tons in 1980.[55] Alfalfa is grown throughout the state, with the greatest production in the central part of the state. Most production is dryland, especially along stream bottoms, but some is irrigated in the western part of the state. Alfalfa is a nutritious animal feed and is rich in protein. Most alfalfa is sun-dried and baled for feed. Some was used green chopped, and dehydrating plants dried or ground into meal a total of 267,300 tons of sun-cured alfalfa.[56]

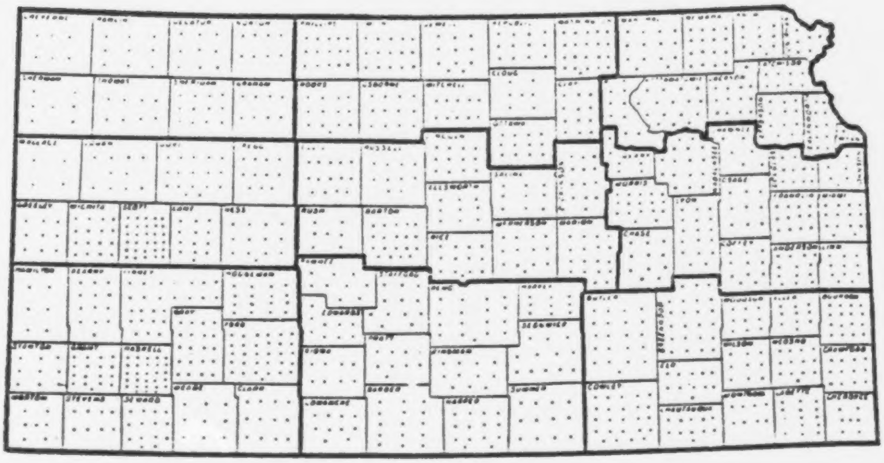
Alfalfa is a restorative crop to the land. It is a legume and with the help of bacteria, it makes nitrogen available to plants. It is also a perennial and effectively stops soil erosion on the land it is growing on. It is grown in solid stands and usually requires no herbicides or pesticides. In 1978, only 6 percent of the acreage was treated for weed control and 13 percent for insect control.[57]

Native prairie hay, red clover hay, bromegrass hay, and other hay were harvested from another 1.2 million acres, producing 1,380,000 tons of hay in 1980.[58] These hay crops are highly nutritious animal feed. Being perennials, they can help stop erosion. Native prairie hay is a valuable resource from areas of the tall grass prairie that never yielded to the plow, with most of this acreage concentrated in the Flint Hills of eastern Kansas. Red clover is a tame leguminous hay and like alfalfa is valuable for more than just its hay. When used in long-term rotations it enriches the soil and disrupts weed and insect pest populations.

Beef

Kansas is a tremendous producer of beef. Production for 1980 was 2 billion pounds from commercial slaughter plants, ranking Kansas fourth in the nation in red meat production by commercial slaughter plants.[59] The beef industry in most years is the basis for the financial success of most Kansas farms, either directly through cattle sales or indirectly through feed grain production which will be fed to cattle. As of January 1, 1981, Kansas had 6,450,000 head of cattle on farms and in feedlots, ranking 4th in the nation.[60] There are more cattle than people in Kansas, with about 2.74 head of cattle for every person (see figure K). This gives a good indication of the importance of cattle to

Figure K



ALL CATTLE AND CALVES JANUARY 1, 1981

1 Dot=5,000 Head

Source: 64th Annual Report And Farm Facts 1980 (Topeka Kansas State Board of Agriculture, 1980).

the Kansas economy. Cattle and calf production were worth $2.8 billion to Kansas farmers in 1980 and accounted for 34.3 percent of the total value of farm production for 1979.[61]

Kansas has a long history of cattle production. At first cattle grazed on the open range and were driven from the ranges in Texas in the 1870's and 1880's to the railheads at cowtowns such as Abilene, Ellsworth, Dodge City, and Wichita. As more farmers came to the state, the open range was closed, resulting in disputes between farmers and ranchers. However, farmers and ranchers are dependent on one another.

Approximately 15.7 million acres of Kansas cropland (51.9 percent) were used in 1980 to feed livestock.[62] There are about 16.3 million acres of rangeland in Kansas, composed of native grasses and forbs. This rangeland supports the cow-calf operations that produce the heifers, steers, and bull calves for the feedlots, that in turn, fatten these livestock primarily with Kansas-grown grains. This rangeland acreage accounts for 33 percent of all Kansas farmland. Another 6 percent is pasture planted primarily in tame grasses.[63]

The growth of the beef industy in Kansas has paralleled the increase of feed grain production, especially the rapid development of irrigated feed grains in southwestern Kansas. Kansas-fed marketings increased from 498,000 head in 1955 to 2.4 million head in 1972, and to 3.4 million head by 1978.[64] Since then, they have declined to 3.0 million in 1980.[65] Although cattle production is distributed across the state, it is concentrated in southwest Kansas where the largest feedlots are located. In 1979, 45 percent of the state's total grain-fed marketings were from the southwestern district of Kansas and 70 percent were from the western third of the state.

The fattening of beef cattle for slaughter is becoming a monopoly for a few very large feedlots in southwestern Kansas. These feedlots are directly dependent on irrigation water from the Ogallala Aquifer to irrigate feed grains and alfalfa. Most beef cattle slaughtered in commerical packing plants are fattened with grains to produce a highly marbled meat which meets USDA marketing standards and consumer preference for a rich and tender meat. Of the 3 million head of grain-fed cattle marketed in Kansas in 1980, 91 percent were fattened for slaughter in commercial feedlots.[66]

Even feedlot production is concentrated in the hands of a few. There are 66 feedlots in Kansas that have a capacity of over 10,000 head, 39 of them are located in western Kansas and 27 are in southwestern Kansas. Southwestern Kansas has 53.4 percent of the total feedlot capacity for the state.[67] The three largest feedlots are located in southwest Kansas and have a combined total capacity of 168,000 head of cattle.[68] Feedlots are not always full, but have considerable turnover and the eight largest Kansas feedlots marketed a total of 638,000 head in 1981.[69]

Most of the beef grown in Kansas is slaughtered in Kansas packing plants. In 1977, there were 64 packing plants in the state.[70] Since that time, the largest packing plant in the world and the region has been built in southwest Kansas near Garden City. About 20 percent of the beef that Kansas packing plants process comes from out of state.[71] Kansans consume 76.5 pounds per capita each year which amounts to 180 million pounds of beef.[72] With current production techniques this amount of production requires 444,000 acres of cropland (not including rangeland and pasture) to grow feed grains, hay, and silage.[73] However, about 89 percent of the Kansas-produced beef processed by commercial packing plants is shipped out of state, requiring 3.5 million acres of feed grains, hay, and silage for this export production.[74]

The beef industry has been the most important agricultural industry in the state in recent years. It will probably continue to remain strong, but may be in for some hard times. Consumers are buying less beef in favor of other meats because of health concerns and because other protein sources are less expensive. World food needs are expected to increase 100 percent by 2020; in the U.S. an increase of 50 percent is expected. Feed grains will find more competition with food grains and both will probably increase in price, making the cost of beef disproportionately more expensive, since it takes about 8 pounds of grain to make one pound of retail meat in Kansas (see figure L). Also, as the Ogallala Aquifer is lowered further and as the price of energy continues to increase, feed grains will find even further competition with food grains in the feedlot areas of western Kansas.

Kansas grasslands have come under heavy grazing pressure as the breeding grounds for Kansas feedlots. Many acres have been degraded, as unpalatable and undesirable species such as musk thistle, ragweed, ironweed, and various trees and shrubs in eastern Kansas have increased. According to the 1977 Kansas Resource Inventory, 57 percent of the grassland in the state needs conservation work.[75] Most of the undesirable species have been caused by overgrazing or improper range management. In 1978, 2.5 million acres of Kansas rangeland were sprayed with herbicides (principally 2,4-D and 2,4,5-T) to combat these undesirable species.[76]

Figure L

Grain Utilization for Beef

	Pounds Grain Equivalent Per Cow		
	Prevalent	Potential	If Necessary
Cow	300	100	50
Bull	25	10	5
Creep	150	-	-
Replacements	125	30	20
500-700 #	900	400	175
700-1000 #	2100	1200	200
	3600	1740	450
# grain/# live wt.	3.6	1.74	.45
# grain/# retail meat	8.0	3.9	1.0

* Calculations based upon 1000 lbs. live weight and 450 lbs of retail cuts.

Misconceptions:

1) Efficiency of grain use is often quoted only for finishing phase.
2) Approximately 45% of grain equivalent would not be suitable for human food. Examples are grain by-products and damaged or contaminated grain.
3) Who will bear cost of transporting grain to needy world population?
4) If priorities for use are to be established, what will be done about pet food and horse feed!

Source: Jack Riley, Animal Science Department, Kansas State University.

Despite some drawbacks, the beef industry has a definite future in Kansas. The prairies evolved with grazing animals, and if properly managed, are a sustainable meat-producing resource. Beef cattle don't have to be fed grains that are potential human foods. If necessary, beef cattle can be raised in Kansas using one pound of grain per pound of retail meat produced (see figure L). This is possible because cattle can utilize pasture crops, eat large quantities of roughage, utilize cash crop by-products, and eat damaged or contaminated grains that are unfit for human consumption.

Beef cattle also produce manure which is valuable as a fertilizer and soil conditioner. Some cattle feeders recognize this resource and return it to their fields or sell it for others to use. Other feeders look upon manure as a waste product and not the valuable resource it really is. In 1974, beef cattle produced 3.4 million tons of manure in Kansas of which 55 percent or 1.8 million tons were considered to be economically recoverable. This would amount to 82 pounds per acre of cropland and pasture in Kansas. Total nutrients from this waste are 118,000 tons of nitrogen worth $11.2 million in 1980, 56,000 tons of phosphorus worth $6 million, and 116,000 tons of potassium worth $9.6 million.[77]

Pork

The current trend in the pork industry is toward very large confinement operations that are removed from the traditional diversified farm enterprise which feeds grain produced on the farm to hogs. This trend has been accelerated by tax policies and research which have encouraged large confinement feeding operations.[78] The Kansas pork industry has followed the trend with the 38 largest commercial feeders having a maximum capacity of 192,000 head (over 5,000 head per feedlot)[79] with more than one generation per year.

There were 1,635,000 market hogs raised in 1980 and 265,000 breeding head with a combined market value of $123,500,000 (see figure M). Pork production from slaughter plants was 257 million pounds retail weight. Kansans consumed 161 million pounds in 1980 or 68.3 pounds per person.[80] About 37.5 percent of Kansas pork production was shipped out of the state. Cropland required to feed hogs (corn, grain sorghum, and soybeans) totaled 635,000 acres.[81]

Lamb and Mutton

In 1980 Kansas had 200,000 head of sheep, but only produced 259,000 pounds of retail weight lamb and mutton.[82] Almost the entire production was shipped out of the state to be slaughtered because there are no large processing plants in Kansas. When compared to the 1980 consumption of 3,062,000 pounds (1.3 pounds per capita),[83] 91.5 percent of consumption was imported. Cropland required for sheep production was 13,000 acres, not including pasture or rangeland.

Dairy

The Kansas dairy industry is strong and has a greater percentage of its production used locally than any other agricultural sector in the state (see figure N). This can be attributed to milk being a perishable commodity and quite heavy, making transportation expenses high. The Kansas dairy industry is a family farm enterprise much more so than production of other livestock in the state because there is a very strong USDA Dairy Support Program which has not encouraged the centralization of this industry.

Figure M

ALL HOGS AND PIGS, DECEMBER 1, 1980

1 Dot=2,000 Head

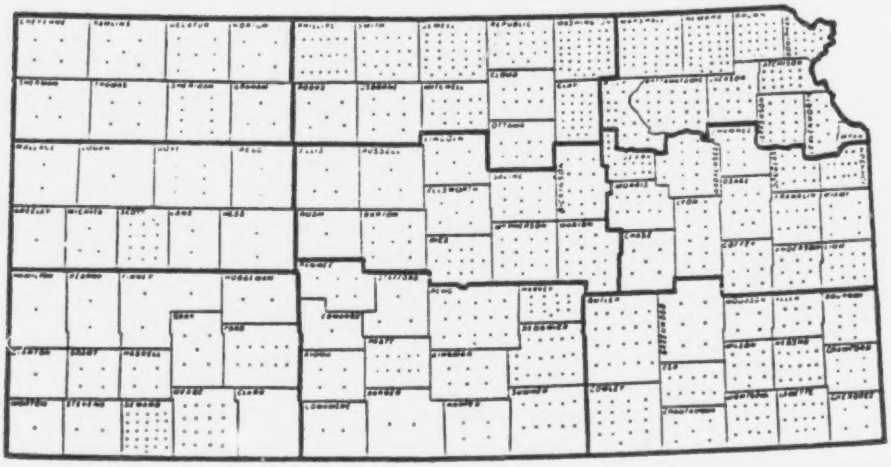
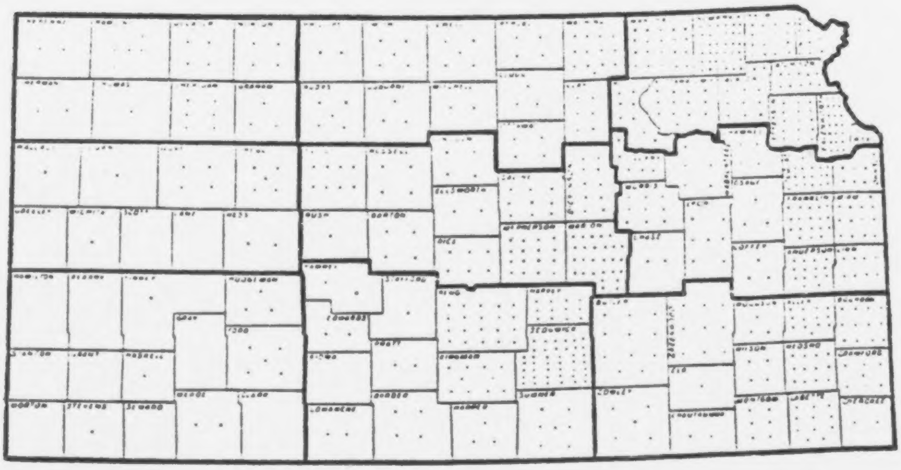


Figure N

MILK PRODUCTION, 1980

1 Dot=2,000,000 lbs.



Source: 64th Annual Report and Farm Facts 1980 (Topeka: Kansas State Board of Agriculture, 1980)

In 1980, there were 123,000 milk cows on 6,200 farms. They produced 1,355 million pounds of milk or 11,000 pounds per cow which was worth $175 million to farmers.[84] This milk was sold primarily to the 27 bulk milk and cheese processing plants in the state.[85] For the most part, production and consumption of dairy products are about equal, with the state exporting a minor share. In 1980, Kansas per capita consumption of dairy products was 294 pounds.[86] Feeding the 123,000 head of milk cows required 361,000 acres of cropland to produce grain, hay, and silage.[87]

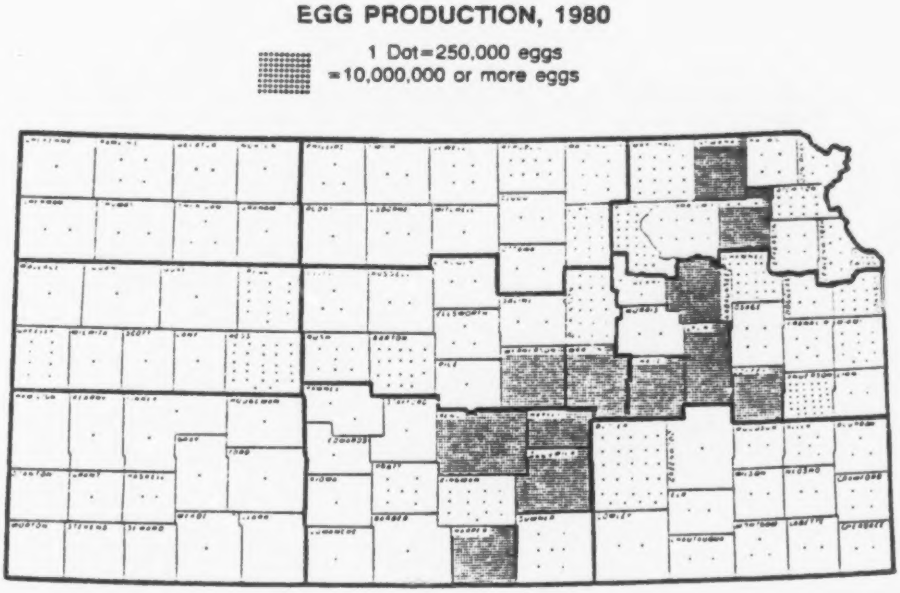
Poultry

The poultry industry has been declining in Kansas since the 1940's. Over 90 percent of the chicken and turkey that Kansans consume is imported into the state. Egg production has also declined, but Kansas egg production still accounts for 68.4 percent of consumption. The poultry industry has become centralized with tens of thousands of caged birds not uncommon for one operation; several operations have over 100,000 birds (see figure 0). Egg production is not entirely a farm enterprise as Cargill, a multinational corporation, supplies the feed and owns the birds that lay half of the eggs in Kansas.[88]

Fish

Kansas fish production is a small but growing source of meat for Kansans with potential for expansion. In 1980, about 1,646,000 pounds of dressed fish, mainly catfish, were raised and another 373,820 pounds of commercial rough fish were harvested by commercial fishermen in the Missouri River

Figure 0


EGG PRODUCTION, 1980
1 Dot=250,000 eggs
▦ =10,000,000 or more eggs

Source: 64th Annual Report and Farm Facts 1980 (Topeka: Kansas State Board of Agriculture, 1980).

and other Kansas waters.[89] A new program has been established for netting fish commercially in selected reservoirs across the state. Kansans' consumption of fish in 1980 was 29,900,000 pounds or 12.7 pounds per person.[90] Ninety-three percent of our consumption was imported.

Wild Game

The harvest of wild game is a substantial, but often overlooked food source for Kansans. In 1980, over 10,300 whitetail and mule deer were harvested, 972,000 pheasant, 1,186,000 quail, 200,000 ducks and 10,000 geese (in an off-year for waterfowl).[91] Wild game harvested in Kansas in 1980, even when priced conservatively, was worth at least $5.3 million (estimated at $2.00 per pound).

Vegetables

Kansas has a history of substantial vegetable production. But while Kansas population has increased, there has been a decrease in the production, acreage, and variety of vegetables grown in Kansas. In 1930 there were 56,732 acres of commercially-grown vegetables in Kansas. This has dropped 87 percent to only 7,265 acres in 1980 (see figure P). Potatoes have continued to remain the dominant vegetable crop.

Kansas was a major potato growing area for the U.S. up to the 1950's when the Kaw (Kansas River) Valley potatoes were marketed in early summer before the main northern crop was ready for harvest. Potatoes were shipped by the thousands of train carlots to eastern markets. A farmers cooperative marketing association was active from 1930 to 1936 and in 1931, shipped 71 percent of all the potato carlots leaving the Kaw Valley.

The Kaw Valley potato industry declined for reasons that are not entirely clear, although competition from California growers and several

Figure P Selected Vegetable Production

Vegetable	Acreage 1920	 1930	 1980
Asparagus	115	441	0
Beans, Snap	191	553	100
Cabbage	527	696	350
Carrots	8	48	0
Celery	13	19	0
Cucumbers	142	357	85
Eggplant	0	0	85
Lettuce	99	125	0
Onions	344	442	50
Potatoes	47,246	42,310	1,650
Peas (green)	167	129	0
Peppers	29	40	85
Radishes	25	18	0
Spinach	11	225	250
Sweet Corn	1,633	2,871	3,000
Tomatoes	1,867	2,668	110
Turnips	64	87	700
Horseradish	12	128	0
Parsnips	24	7	0
Sweet Potatoes	4,366	3,583	800
Mixed Vegetables	521	969	0
Other Vegetables	70	285	0
TOTALS	57,784	56,732	7,265

Source: 1920 and 1930 figures from "A Chronological Comparison of Agricultural Census Data by Crop Reporting Districts in Kansas--1900 to 1935," W.P.A. Projects Administration of Texas. 1980 acreages are from James Greig, Kansas State University, Department of Horticulture.

severe floods were contributing factors. However, with changing economics, increased energy expenses, and support of local production, the Kansas potato crop may bloom again. A Kansas State University horticulture professor has stated:

> We are finding at the present time that in many instances over half the value of potatoes is tied up in fuel costs in transporting them from the areas of production to the area of use. It makes relatively little sense to grow potatoes in California or other areas of the West, ship them to Kansas and waste all that money in declining fossil fuel reserves.[92]

One area that could rapidly develop into a vegetable-producing area is irrigated land in southwest Kansas. As long as the mining of groundwater is allowed, irrigators will pump it up as long as it is profitable. Even where the aquifer is not being depleted, the cost of pumping water is changing the economics of crop production. Vegetables are more profitable than grain crops under irrigation. They require some special attention, but cultural practices are not a barrier to their production in southwest Kansas. Organizational and distributional barriers do exist, and for southwest Kansas to be able to enter a larger market, joint investment and coordinated marketing efforts would be required.[93]

Rather than relying on specialized production by large growers to meet our needs, de-centralized vegetable production that surrounds population centers should be encouraged. This would stimulate the local economy, employ more people and provide a local source for a variety of farm-fresh foods. One of the largest vegetable growers in the Midwest farms 3,000 acres of vegetable crops (primarily sweet potatoes, potatoes, and sweet corn) in the Kansas City area and ships then all across the Midwest. If this same acreage was divided into smaller parcels to surround the Kansas side of metropolitan Kansas City, it could supply a substantial portion of the city's in-season vegetable needs. In total, only 38,250 acres of vegetables are required to meet the consumption of fresh and processed vegetables by Kansas citizens.[94]

De-centralized production is already occurring. There are 178 roadside markets, and fourteen Kansas communities have farmers markets which sell locally-grown fruits, vegetables, and honey.[95] Also, home garden production in Kansas was worth $60 million in 1980.[96] Forty-seven percent of all households in the U.S. had gardens in 1981 and the number is climbing because people are motivated by higher food prices to offset inflation.[97] The percentage of home gardens in Kansas is probably even higher because of our more rural character and available land for gardens.

FRUIT PRODUCTION

There is a long history of fruit growing in Kansas, going back to the Native American's use of wild fruits and Coronado's observation in 1541 that "we find prunes like those in Spain, some of which were black; also some excellent grapes and mulberries."[98] As the prairies of Kansas had few trees, the pioneers planted trees, including many fruit trees.
Fruit culture reached its peak of importance around the turn of the century and has been in decline ever since.

Apples

Apples have remained the most important fruit produced in Kansas, but only at a fraction of their previous importance. Kansas produced 3,714,000 bushels of apples in 1890. By 1980 this had decreased to 577,500 bushels. In 1897, Kansas had 11,187,332 apple trees (more than 7 trees per person) covering 2,035,000 acres. In 1980 there were only 1,800 acres of commercially grown apples[99] (see figure Q).

Figure Q

FRUIT, 1916-1980

Year	Commercial Apples			Peaches			Grapes		
	Bearing acres	Production, million pounds	Farm value (thousands)	Bearing acres	Production, million pounds	Farm value (thousands)	Bearing acres	Production, tons	Farm value (thousands)
1916	....	....	....	....	3.2	$122	....	....	....
1917	....	....	....	....	3.2	165	....	....	....
1918	....	....	....	....	2.4	188	....	....	....
1919	....	34.4	....	11,300	10.3	378	2,300	2,700	....
1920	....	34.8	....	10,800	7.8	551	2,600	1,800	....
1921	....	4.4	....	10,300	5	45	2,800	1,400	....
1922	....	71.3	....	9,900	35.9	1,010	3,000	3,300	....
1923	....	52.2	....	9,500	4.0	214	3,200	2,700	....
1924	....	52.2	....	9,000	9.6	410	3,400	3,000	$270
1925	....	39.2	....	8,600	13.7	572	3,600	2,500	212
1926	....	43.5	....	8,200	10.0	355	3,700	4,000	340
1927	....	58.6	....	7,800	9.4	343	3,800	4,200	315
1928	....	23.5	....	7,400	2.7	108	3,900	4,200	336
1929	....	37.6	$1,962	7,100	12.3	397	4,000	4,600	322
1930	....	17.2	998	7,500	1.3	40	4,000	3,500	282
1931	....	37.4	792	6,900	14.6	274	3,900	4,900	245
1932	....	15.2	1,624	6,900	2.2	55	3,800	4,900	196
1933	....	39.2	530	6,800	.7	23	3,600	4,200	189
1934	16,400	25.4	708	6,600	5.3	121	3,600	2,700	135
1935	16,400	49.2	1,018	5,800	10.1	252	3,400	4,000	180
1936	15,000	9.1	294	5,500	8	28	3,000	1,000	50
1937	13,300	51.2	1,001	3,700	8.2	214	2,200	2,600	143
1938	12,900	23.3	509	3,100	1.4	38	2,000	2,200	121
1939	11,400	46.8	917	3,300	5.8	139	1,900	2,900	118
1940	11,100	58.6	1,238	3,100	6.7	154	1,700	3,100	130
1941	9,100	17.7	467	2,300	1.2	30	1,600	2,100	105
1942	6,900	27.5	950	1,100	1.1	43	1,600	2,900	160
1943	6,300	12.1	534	1,500	.1	8	1,600	1,700	162
1944	6,200	15.1	996	2,100	.7	49	1,600	2,100	210
1945	5,700	14.1	998	3,200	3.9	227	1,600	2,300	175
1946	5,400	22.4	1,465	4,200	7.4	370	1,300	1,400	129
1947	5,100	29.0	1,382	4,500	6	34	1,100	1,400	123
1948	4,600	12.4	641	4,400	7.7	360	1,000	1,700	129
1949	4,100	23.2	836	4,500	8.9	324	1,000	1,600	128
1950	3,600	8.9	502	4,600	5.6	287	900	1,400	120
1951	3,500	18.8	834	4,400	6.2	312	800	1,300	112
1952	3,400	9.0	662	3,900	6.3	304	600	900	78
1953	3,000	7.6	522	3,000	3.8	200	500	600	60
1954	2,800	9.0	546	3,000	6.2	250	400	500	60
1955	2,600	10.0	518	1,900	5.2	265	300	500	60
1956	2,300	2.3	140	1,800	2.3	110	300	100	12
1957	2,200	12.8	500	1,600	7.4	333	300	600	60
1958	2,000	7.8	378	1,600	6.5	324	300	500	60
1959	1,900	10.0	446	1,500	4.8	259	300	400	60
1960	1,800	9.2	481	1,600	7.9	467	300	400	60
1961	1,700	10.5	492	1,800	6.5	367		Grapes discontinued.	
1962	1,700	9.1	459	2,000	4.6	308			
1963	1,600	9.1	450	2,000	2.4	171			
1964	1,600	14.3	687	2,100	8.4	475			
1965	1,600	13.0	308	2,000	7.2	407			
1966	1,700	9.3	322	2,000	1.0	79			
1967	1,700	7.5	432	2,000	3.6	324			
1968	1,700	17.0	911	1,900	6.2	527			
1969	1,500	17.6	915	1,900	9.5	703			
1970	1,900	13.0	536	2,000	8.0	608			
1971	1,700	15.5	966	2,000	6.0	528			
1972	1,900	12.4	658	1,800	1.7	153			
1973	1,900	15.0	1,110	2,000	10.0	1,120			
1974	1,900	14.3	1,372	2,000	2.5	325			
1975	1,900	17.0	1,444	2,000	11.0	1,485			
1976	1,900	11.4	901	2,000	4.0	660			
1977	1,900	16.0	1,408	1,200	9.0	1,350			
1978	1,800	10.0	1,110	1,100	5.0	860			
1979	1,500	13.0	1,340	1,100	5.0	1,250			
1980	1,300	11.0	989	1,100	6.5	1,300			

Source: 64th Annual Report and Farm Facts 1980 (Topeka: Kansas State Board of Agriculture, 1980)

In 1900, 90 percent of all apple seedlings used in the U.S. were believed grown on 800 acres of Kaw bottom land near Topeka.[100] In 1903 Frederick Wellhouse was considered the Apple King of the World, having 1,637 acres of apple orchards in northeast Kansas--the largest number of acres under one management in the world.[101] These examples show the former importance of apples in Kansas. Kansas *can* be a major apple-growing region, and centralization and specialization of crop production are not new to Kansas agriculture, although this trend has recently intensified.

Kansas currently has a significant production of apples, cantaloupe, peaches, and watermelon. We have the potential to grow all our needs for these fruit crops and also for cherries, grapes, nectarines, apricots, pears, plums, and strawberries. In 1980, there were 3,260 acres of fruit crops. To meet our consumption of the above crops, 8,063 acres would be needed.[102]

There has been an interesting trend in the consumption of fruits and vegetables in recent decades. Per capita consumption of leafy, green vegetables (lettuce, spinach, and celery) has increased, while there has been a decrease in the consumption of starch root crops (potatoes, sweet potatoes, and turnips). There has also been an increase in the consumption of citrus fruits, while the traditionally popular apple has declined.[103]

This has occurred mainly because the leafy, green vegetables and citrus fruits have become available to us all year around, due to inexpensive energy for transportation. This has allowed their production to be centralized in places like southern California and then shipped to Kansas. The traditional winter root crops and apples have lost their popularity. How many people today would say that they like turnips or parsnips, or would prefer a winter apple instead of an orange?

Kansans can become more self-reliant in fruit and vegetable production. Consumers need to support local growers whenever possible. Our diets need to be more attuned to the season when a Kansas farmer can harvest his perishable crops. Locally-grown produce can add to our margin of health because of its added freshness and nutritional quality. Tomatoes, sweet corn, and peaches will not come from Kansas fields and orchards in the middle of winter. Eating more cold hardy crops such as carrots, turnips, kale, and apples can extend the season of production for Kansas-grown vegetables and fruits. Local and home preservation of foods can stretch out Kansas food production throughout the year. Canning, freezing, drying, and the use of root cellars are important food preservation strategies.

Honey and Sugar

Bees are valuable as honey producers and even more valuable as crop pollinators. In 1980, over 2.1 million pounds of honey were produced worth $2.5 million retail value, providing 76.1 percent of our consumption of honey.[104] Yields per colony were about 50 pounds.[105]

Bees pollinate the alfalfa, lespedeza, and red clover seed crops; apples, peaches, and melons. In 1979, it was calculated that this service had a total economic impact of $16.3 million to the state.[106]

The Kansas sugar beet industry has declined to 15,000 acres of irrigated land in northwest Kansas. Production was 400 million pounds of beets in 1980[107] which resulted in 49 million pounds of refined sugar.[108] Kansans consume 83.6 pounds of refined sugar per person[109] for a total consumption of 196,922,800 pounds, so we import 75 percent of our sugar.

CONSUMPTION OF FOOD IN KANSAS

Kansas residents consumed 3 billion pounds of food in 1980 worth $2.1 billion. It would require 2.1 million acres to meet this consumption.[110] Kansas is fortunate to have 49 million acres of cropland (over 20 acres per person) and 27.3 million acres of prime farmland.

Kansas produces much more food than Kansans consume, but most foods that Kansans eat are not grown or processed in Kansas. When a person walks into a grocery store or supermarket in Topeka or Garden City or elsewhere to buy food, the foods that are bought (with the exception of beef, pork, dairy and wheat flour products) probably do not come from Kansas.

Two reasons for the consumption of non-local foods are the national distribution system of foods and the production of foods in specialized areas. Just as Kansas has specialized in wheat and beef, California has specialized in fruits and vegetables. Specialized production has been possible partly due to the economies of scale--as production costs per unit of a commodity decline, more units can be produced--up to certain limits. However, it has been the relatively inexpensive sources of energy that have made mass production and distribution systems economical. Now, energy economics are making foods more expensive. Consumers can either cope with the present system or actively work to change it. The "Action Toward Sustainability" section of this study suggests many actions that we can take to redirect our food system.

What would Kansans do if we could not get our food from California or Florida or Mexico? The effects of a major strike in the trucking industry or a decreased oil supply would be devastating. About 500 truckloads of food come into Kansas each week to maintain our food supply.[111]

More likely than a total shutdown of the distribution system, would be a reduced supply and a drastic price spiral. A recent study by the U.S. Department of Energy disclosed that a 10 percent reduction in the oil supply would result in a 55 percent increase in the cost of raw commodities.[112] In May, 1981, the cost of transporting one truckload of fruits and vegetables was already over $1.11 per mile.[113] Aside from the vulnerability of the transportation system, we are also vulnerable to weather extremes in other areas (freezes, droughts, floods) and pest problems (infestation of a production-specialized area by a Mediterranean fruit fly type pest).

In 1980, Kansas imported $772 million worth of basic foodstuffs (41 percent of our food) into the state.[114] Although this is less than the amount of food exported, food imports represent a drain on the Kansas economy that each person pays for. Each Kansas citizen paid $328 in 1980 for basic foodstuffs that were imported into Kansas.

Food and food products that are produced within our state produce income that circulates and actually multiplies the initial value of the food. Income multipliers have been determined for many Kansas commodities. They vary from a low $1.67 for corn to $5.00 for cattle, and to $7.00 for grain mill products (see figure R). These figures would be even larger if we had a more decentralized food system since local production stimulates local industries. Kansas imports a lot of high value fruits and vegetables that have large income multipliers when processed and used within our state. Foods shipped into Kansas represent not only a drain on our economy, but the loss of potentially multiplying that value by employing more Kansas citizens.

Figure R

Income Multipliers: Ratio of Initial Income Effect To Total Income Effect

Sector	Multiplier
Corn	1.669853
Sorghum	1.708417
Wheat	1.798618
Other Grains	1.768416
Soybeans	1.729307
Hay	1.558831
Dairy Products	3.386584
Poultry and Poultry Products	1.803633
Cattle	5.001746
Hogs	3.291745
Other Agricultural Products	2.237196
Agricultural Services	1.862006
Meat Products	6.948381
Grain Mill Products	7.179258
Other Food & Kindred Products	3.083890
Farm Machinery	1.697356
Groceries	1.655767
Farm Products	2.200621
Eating and Drinking	1.878326

Source: The Inter-Industry Structure of the Kansas Economy, Kansas Department of Economic Development, Topeka, 1969, p. 153-155

The $772 million worth of food imported into our state, when multiplied by the farm products multiplier of 2.2 in figure R, results in $1.7 billion that could be added to the state's economy solely by growing our own food. This figure is probably quite conservative, and would be multiplied even further in cases where the food was processed or preserved for the off-season.

Buying foods from afar also affects their quality, taste, and our health. The best tasting, highest quality foods are those that have the shortest distance and time from the field to the table. These homegrown or local foods will retain their highest nutrition if stored, processed, and prepared properly. Non-local foods have to keep longer and are more likely to contain chemical preservatives to help them maintain "shelf-life". Many of these substances are suspected of causing a variety of deleterious side effects to human health, including cancer, and all of them are an added expense. Kansans should weigh the full costs of food imports, eat more local foods, and encourage more local production for the health of our economy and ourselves.

NEGATIVE IMPACTS OF CURRENT PRODUCTION PRACTICES

Kansas agriculture is extremely productive. However, current production practices have taken a significant, but not always directly observable toll on the environment and resources of Kansas. Kansas agriculture has made a significant impact on our soils and water, which affects the environment and animal life, including humans.

Soil Erosion

Kansans have long heard the cry of alarm about soil erosion and depletion. The First Biennial Report of the State Board of Agriculture stated in 1878 that we must "warn the farmers of Kansas against doing precisely what the settlers of the older States did in taking from the earth more than they returned to it, thereby robbing it of its elements of fertility."[115] The cry was heard again during the Dust Bowl of the 1930's. Now the cry is not so loud, although the problem is still serious. The abundant productivity of Kansas agriculture has given us a false sense of security.

Soil erosion is often a hidden process, occurring at rates slow to the eye, but rapid in geologic time. Earth-moving equipment is often used to hide the scars of water erosion. Nutrients that are carried away by wind and water are replaced by chemical fertilizers. Kansas loses 193 million tons of soil annually due to erosion by water and wind.[116] This is nine times greater than the 1980 weight of production of wheat, corn, grain sorghum, oats, barley, rye, soybeans, popcorn, and dry beans. It would take 4,825 trucks, loaded to their full capacity, to haul this amount of soil.[117] There is an acceptable rate of erosion of five tons per acre per year on cropland and pasture and two tons per acre on rangeland. With erosion up to these amounts, it is believed that "a high level of cropland and rangeland productivity can be obtained economically and indefinitely."[118] These figures are based upon the rates that soils form and the rate that soils leave the field. However, the Soil Conservation Service reports that 54 percent of Kansas cropland needs additional conservation treatment.[119] Sixteen million acres of land in Kansas are eroding at rates that are higher than the acceptable level and 6.8 million acres of cropland or 14 percent are losing more than 10 tons of soil per acre per year.[120]

Soil erosion varies from east to west across Kansas. Brown County, located in northeast Kansas, has thick, highly erosive loess soils and receives about 36 inches of rainfall per year. Its 260,000 acres of cropland lose on the average 6.66 tons per acre per year due to sheet and rill erosion, and 14,000 of those acres lose an average of 15.4 tons per acre per year.[121]

Grant County is located in southwest Kansas and receives about 18 inches of rainfall per year. Wind erosion is a more serious problem here, with the county's 300,000 acres of cropland losing an average of 6.61 tons per acre per year due to wind erosion and an additional 2.03 tons per acre per year due to sheet and rill erosion.[122]

Soil erosion is not just the loss of a physical substance--dirt; it is the destruction of an organic entity full of life. The value of nutrients, organic matter, tilth, soil fauna and flora lost due to soil erosion is quite large, yet difficult, if not impossible to calculate. The future of Kansas agriculture depends on the soil. Rich prairie soils are a valuable resource that should not be diminished or depleted, but managed, protected, and cherished.

Groundwater Depletion

The Ogallala formation of the High Plains Aquifer underlies a good portion of western Kansas, and is one of America's major aquifers. Starting in the 1940's in Grant County in southwest Kansas, this source of water, which is naturally less than 100 feet below the ground in most places, has been pumped up to irrigate Kansas crops.

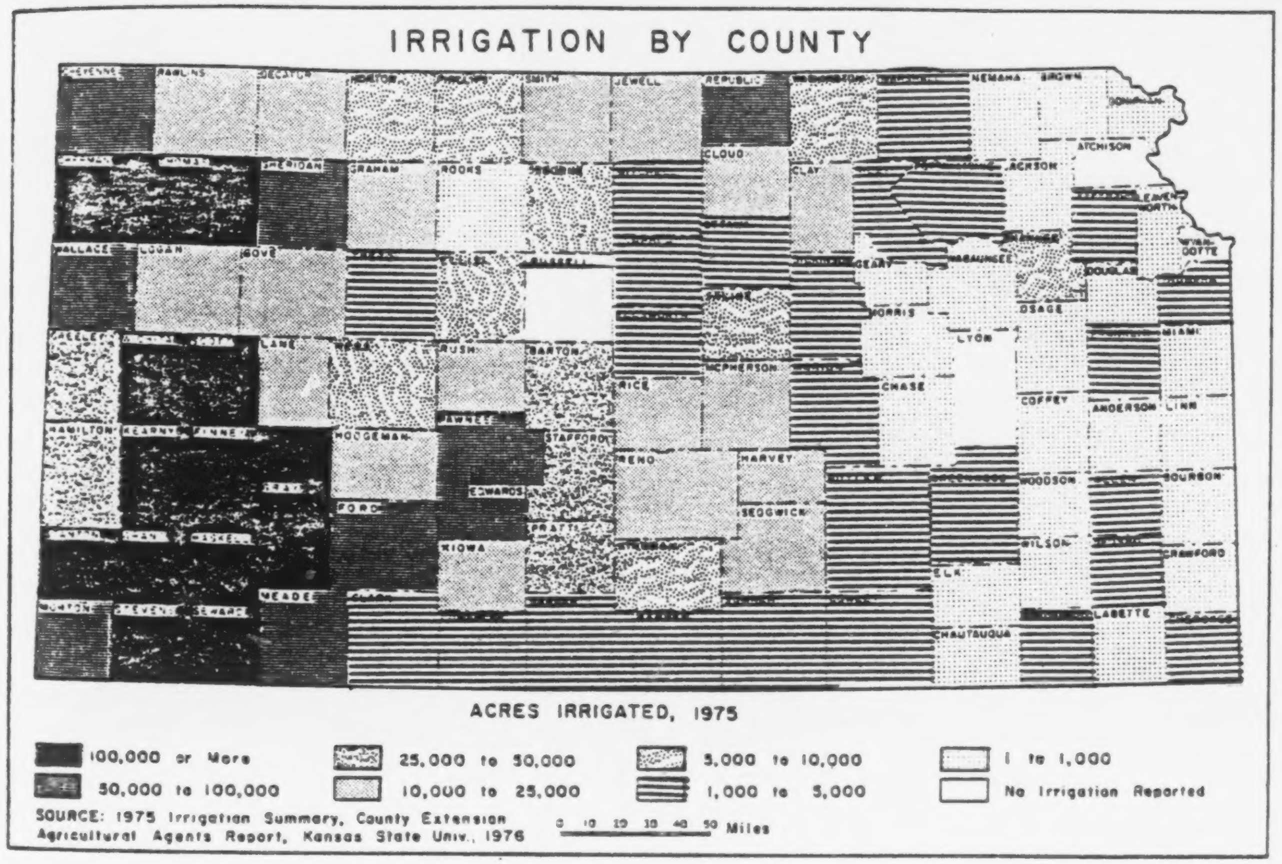
Irrigating crops has been very profitable for farmers and has dramatically changed the economics of western Kansas agriculture. The counties with the three highest personal farm incomes--Finney, Ford, and Haskell--are located in the most heavily irrigated portion of southwest Kansas and have farm incomes that were triple the state average.[123]

Irrigation has intensified in recent years in western Kansas, especially with the use of center-pivot irrigation systems. By 1977 the number of irrigated acres peaked at 2.2 million[124] (see figure S for 1975 data and Figure F for 1979 data). Irrigation is the main use of groundwater within the state and increased from 68 percent of total withdrawals in the state in 1965 to 80 percent by 1975 (see figure T).[125]

In eastern and central Kansas, natural recharge by rainfall is currently adequate in maintaining the saturated thickness of the aquifer. However, in western Kansas natural recharge is less than one-half inch per year, making the aquifer essentially a nonrenewable resource. The saturated thickness of the aquifer continues to decline.[126] For the year preceding February, 1981, the water-level (saturated thickness) dropped on the average about one and one-half feet in western and south-central Kansas and for 1982 declined another one-half foot (following a year of above average rainfall).[127]

One hundred and eighty million acre feet of the High Plains Aquifer had been dewatered in Kansas by 1980. This accounts for 8 percent of the pre-development level, but some areas have been depleted by over 25 percent and several areas are over 50 percent depleted[128] (see figure U). In 1977, the average saturated thickness varied from 244 feet in southwest Kansas to 96 feet in northwest Kansas to 53 feet in west-central Kansas.[129] Six of 13 counties in southwest Kansas have

Figure S


IRRIGATION BY COUNTY
CHEYENNE
RAWLINS
DECATUR
NORTON
PHILLIPS
SMITH
JEWELL
REPUBLIC
NEMAHA
BROWN
ATCHISON
CLOUD
CLAY
SHERIDAN
GRAHAM
ROOKS
JACKSON
WALLACE
LOGAN
GOVE
GEARY
WABAUNSEE
DOUGLAS
MORRIS
OSAGE
LYON
MIAMI
LANE
RUSH
BARTON
RICE
McPHERSON
CHASE
COFFEY
ANDERSON
LINN
HAMILTON
HODGEMAN
PAWNEE
STAFFORD
RENO
HARVEY
WOODSON
BOURBON
FORD
EDWARDS
GRAY
SEDGWICK
KIOWA
PRATT
WILSON
CRAWFORD
ELK
MEADE
LABETTE
CHAUTAUQUA
ACRES IRRIGATED, 1975
100,000 or More
50,000 to 100,000
25,000 to 50,000
10,000 to 25,000
5,000 to 10,000
1,000 to 5,000
1 to 1,000
No Irrigation Reported
0 10 20 30 40 50 Miles

SOURCE: 1975 Irrigation Summary, County Extension Agricultural Agents Report, Kansas State Univ., 1976

Figure T

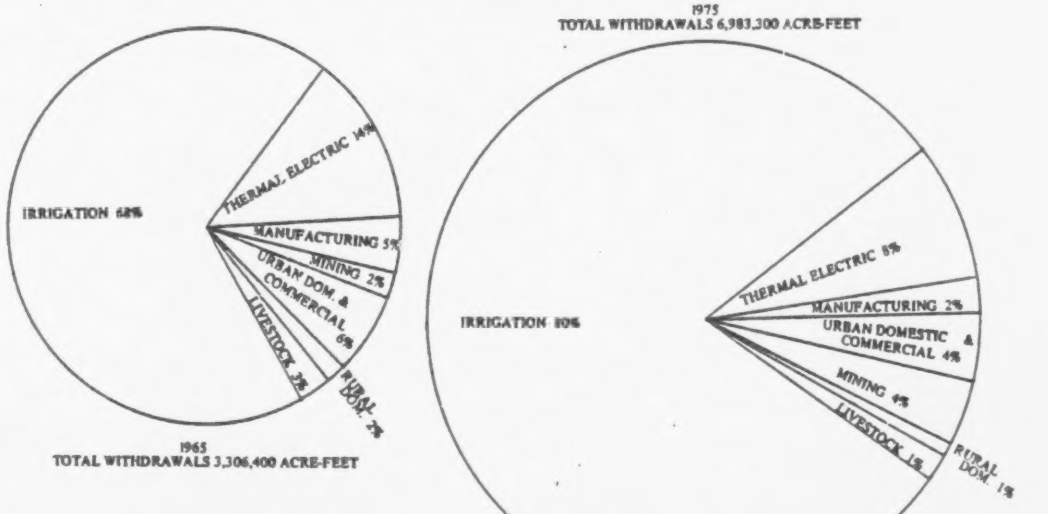
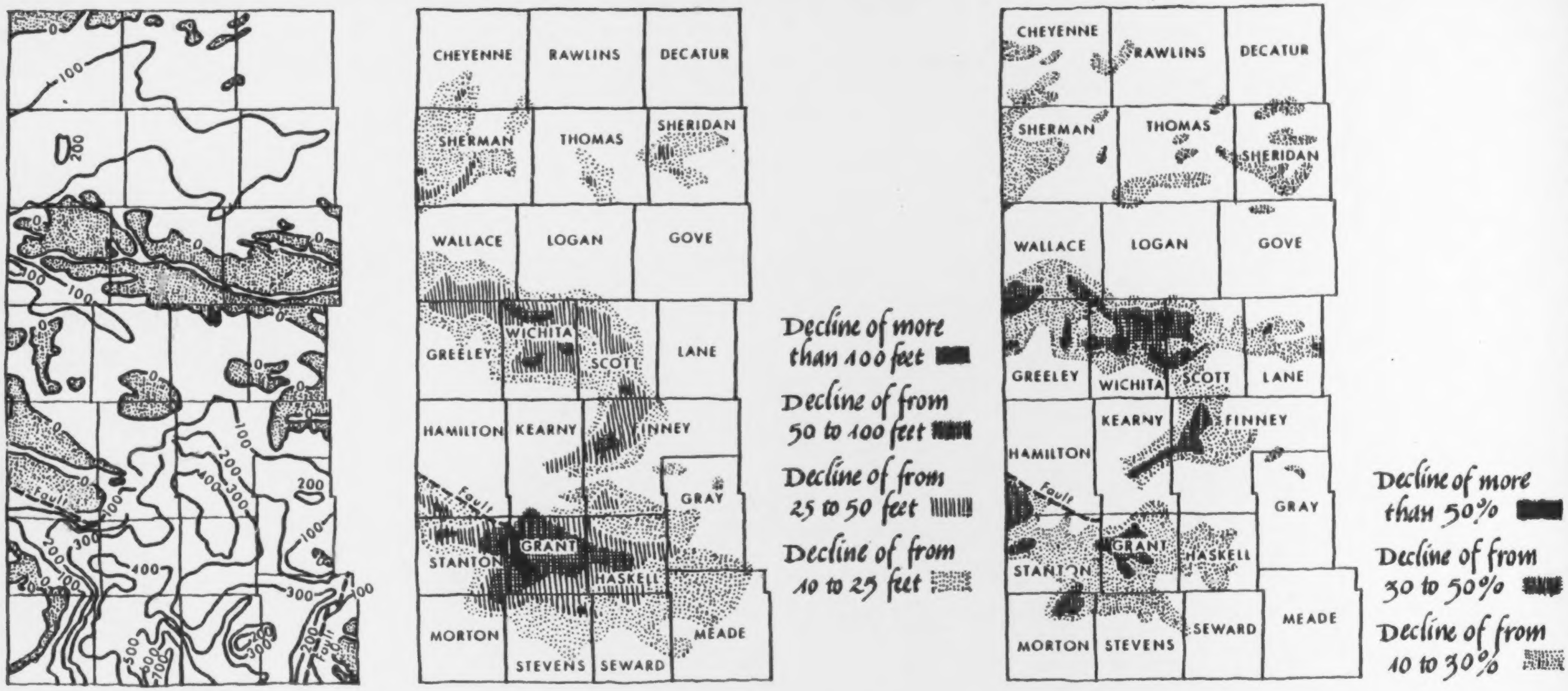


FIGURE 14 DISTRIBUTION OF WATER WITHDRAWALS 1965-1975
KWRB MAY 1978

Source: Socio-economic, Land Use, and Water Use Information and Projections (Topeka: Kansas Water Resources Board, 1979).

Figure U


0
100
200
300
400
500
Fault
CHEYENNE
RAWLINS
DECATUR
SHERMAN
THOMAS
SHERIDAN
WALLACE
LOGAN
GOVE
GREELEY
WICHITA
SCOTT
LANE
HAMILTON
KEARNY
FINNEY
GRAY
STANTON
GRANT
HASKELL
MORTON
STEVENS
SEWARD
MEADE
Decline of more than 100 feet ■
Decline of from 50 to 100 feet ▥
Decline of from 25 to 50 feet ▥
Decline of from 10 to 25 feet ▨
Decline of more than 50% ■
Decline of from 30 to 50% ▥
Decline of from 10 to 30% ▨

Estimated Saturated Thickness 1965

Estimated Water Level Declines 1950-1975

Percent Change in Water Level Since 1950

REGION*	1975 Acres		1975 Estimated Groundwater Supply	Average Annual Precipitation	Evapo-transpiration and Runoff	Recharge	1975 Estimated Groundwater Withdrawn
	Irrigated	Total	million	acre	feet	(ac. ft.)	(ac.ft.)
West Central	411,000	2.4 million	10	3.70	3.66	40,000	589,000
Southwest	1.6 million	6.9 million	223	10.71	10.55	165,000	2.9 million
Northwest	434,000	5.8 million	63	9.33	9.21	111,000	763,000

* These regions include the counties wholly or partially in the corresponding groundwater management district.

Source: Task Force on Water Issues, State of Kansas, Governor's Office, 1977.

had more than 30 percent of their saturated thickness depleted by 1978.[130] (Figures V and W illustrate this trend.)

In western Kansas, irrigation is the planned mining of groundwater in the Ogallala aquifer. There are three ground water management districts for western Kansas. Local people on their boards have made the decision that the beneficial effects of mining the aquifer outweigh the detrimental effects of depleting this resource. The Southwestern Kansas Management Plan stipulates a maximum depletion rate of 40 percent in 25 years.[131] In effect, the decision has been made to allow the current generation to exploit this resource. This policy is encouraged further by the Internal Revenue Service which allows irrigating landowners to take a tax deduction for depreciated land value as a result of groundwater loss.

The Ogallala Aquifer is in no danger of being pumped dry, but it is becoming prohibitively expensive to reach. As the saturated thickness declines, greater numbers of deeper wells are required to irrigate crops, and it soon becomes an uneconomical proposition for crop production. This is already occurring in some areas. Since 1977, total irrigated acres have declined in western Kansas.[132] There has also been a shift from water-thirsty corn to wheat and grain sorghum which only need to be partially irrigated to produce good yields. By 1980, irrigated acres of corn, wheat, and grain sorghum in western Kansas were nearly equal. The shift is directly attributable to increased water pumping costs and to water becoming a limited resource in some areas.[133]

A recent report by an economist of the High Plains Water Study predicts that if future market forces are allowed to affect the costs of production and if currently available and proven technology and

Figure V

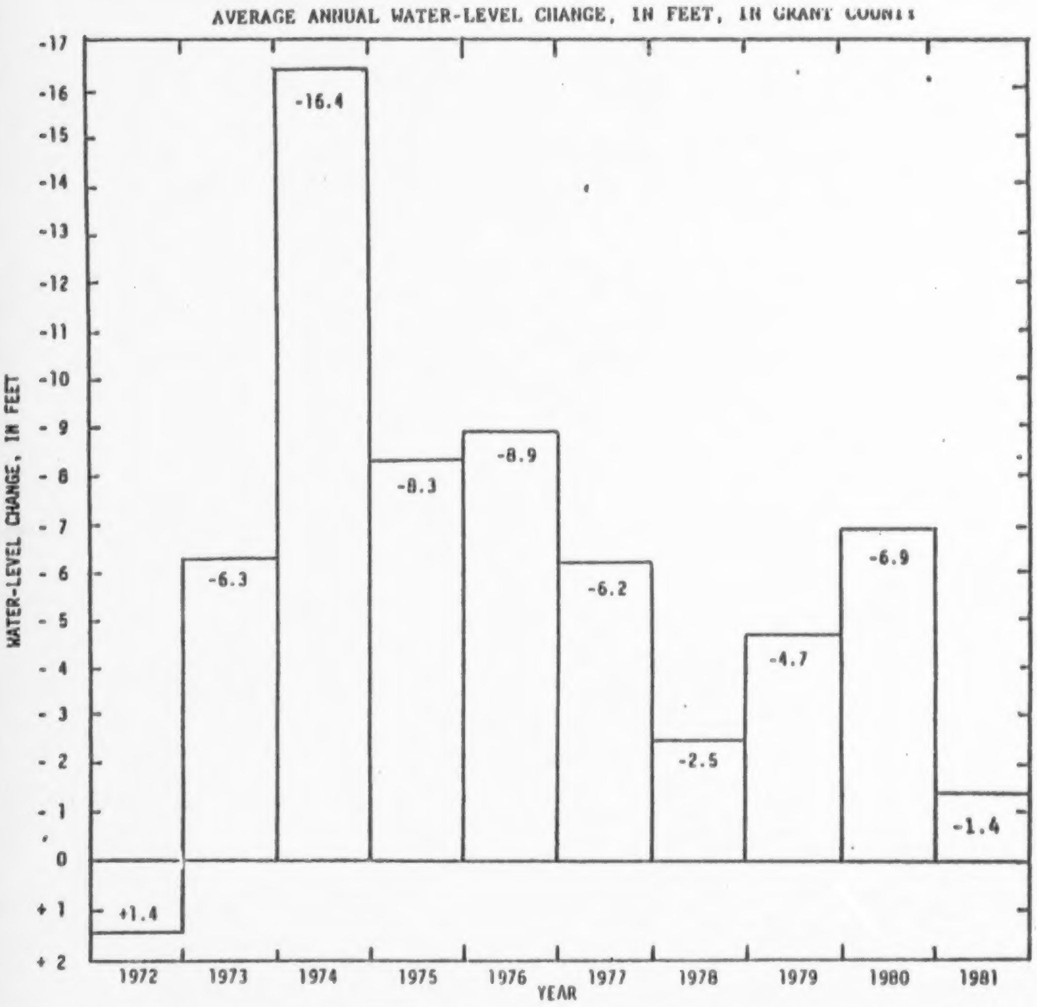
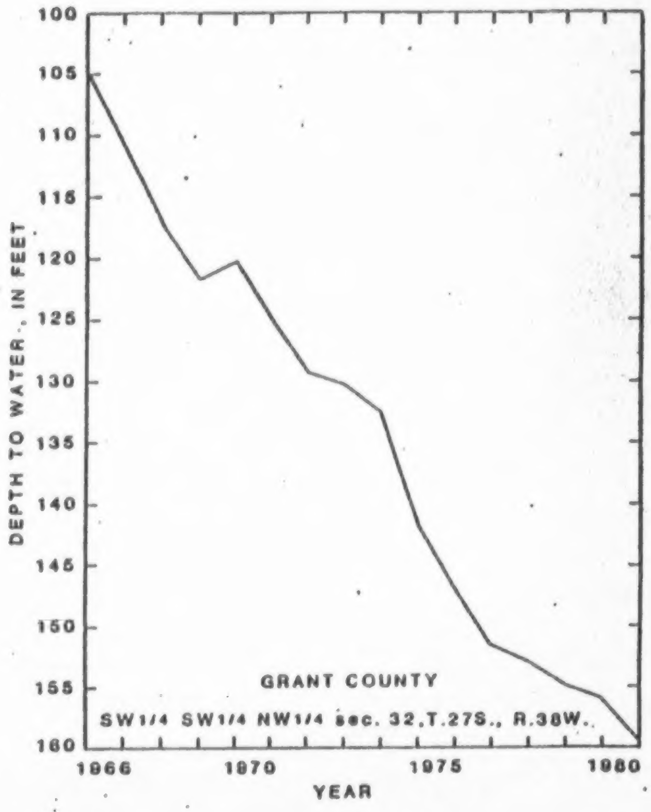


Figure W



Hydrograph for observation well in the SW¼SW¼NW¼ sec. 32, T.27 S., R.38 W., Grant County. Saturated thickness January 1981, 211 feet. Percentage decline in saturated thickness 1966-81, 21 percent.

Source: Howard O'Connor, Kansas Geologic Survey, information from 1981 and 1982 press releases, water levels in Western and South-Central Kansas.

irrigation practices are adopted, then irrigated acreages are estimated to decline 19 percent (0.4 million acres) by 1985; 52 percent (1.1 million acres) by 1990; 57 percent (1.2 million acres) by 2000; and 75 percent (1.6 million acres) by 2020.[134]

A Kansas State Water Plan study states that "the most probable future socio-economic setting in the High Plains area (of Kansas) is a severely constrained irrigated agriculture sector. The majority of irrigated agriculture development would revert to dryland agriculture."[135] (Figure X illustrates the projected water requirements of this area.) This drop in irrigation acreage will have a significant impact on the economy of western Kansas.

There are two proposed technological solutions to abate groundwater depletion--weather modification and inter-basin transfer of water. Western Kansas has been a testing ground for weather modification activities, but the seeding of clouds has yet to be proven economically feasible or entirely successful.[136] Also, the environmental impact of increased weather modification activities has not been adequately calculated.

The movement of water from one water basin to another is also suggested as a solution to western Kansas water problems. It is an uphill proposition (see figure Y) as the areas of the state with supposed excess water are about 2,000 feet lower than the cropland that sits above the Ogallala Aquifer. The energy costs, environmental impacts (due to canals, loss of water from the source, and the construction of power plants needed to pump the water uphill), and political barriers make this proposition of questionable economic feasibility.[137]

Figure X

PROJECTED WATER REQUIREMENTS

HIGH PLAINS AREA

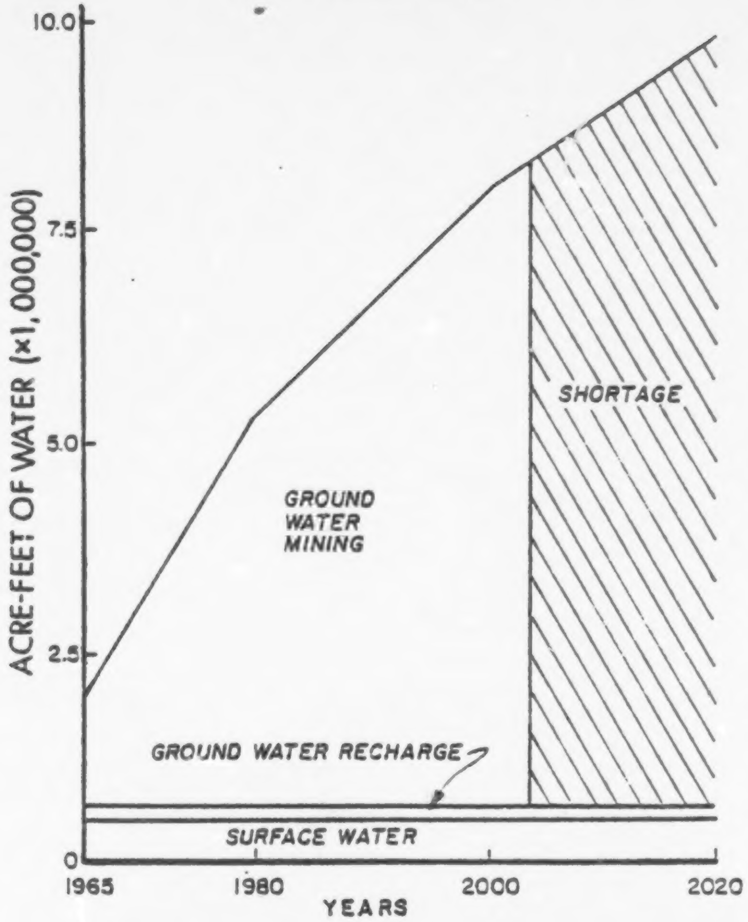
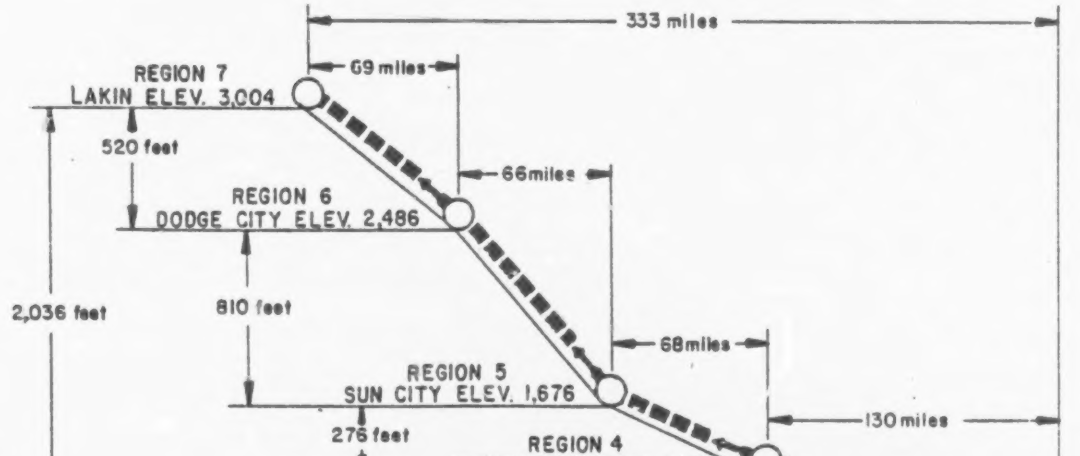


Figure Y

KANSAS STATE WATER PLAN STUDIES, PHASE II

WATER TRANSFER SCHEMATIC FROM ECONOMIC REGIONS 2,4 AND 5 TO ECONOMIC REGIONS 6 AND 7


333 miles
69 miles
66miles
68miles
130 miles
REGION 7
LAKIN ELEV. 3,004
520 feet
REGION 6
DODGE CITY ELEV. 2,486
810 feet
2,036 feet
REGION 5
SUN CITY ELEV. 1,676
276 feet
REGION 4
CHENEY RES. ELEV. 1,400
430 feet
REGION 2
IOLA RES. ELEV. 970

Source: Kansas State Water Plan Studies, Long range Water Supply Problems, Phase II (Topeka: Kansas Water Resource Board, 1979).

Water Quality

Kansas agriculture impacts the quality of groundwater and surface water. As the Ogallala Aquifer is being depleted, ground water quality is becoming a more serious problem. When large quantities of water are pumped out of an aquifer, other water moves in. In some locations of southwest Kansas, adjacent low quality aquifers which have high salt contents move into the aquifer being depleted. This creates problems because salt concentrations in water inhibit plant growth.

Groundwater quality may also be lowered by pesticide and fertilizer contamination. The porous soils of western Kansas are quite susceptible to percolation of agricultural chemicals into the aquifer. Recirculation pits which catch excess irrigation water tend to increase the concentration of agricultural chemicals and the amount that may enter the aquifer. Pesticides do not seem to be a problem yet, but nitrates (from fertilizer) are creating some problems. Of the 274 wells reported in Water Resources Data for Kansas-Water Years, 1977, 30 wells (11 percent) exceeded the EPA drinking water quality standards for nitrates.[138] Two more direct ways that groundwater contamination occurs are through leaky well casings and agricultural chemicals flowing back into the aquifer through inactive irrigation systems.

Surface water quality degradation is caused by erosion from fields, dewatering of streams, feedlot runoff, and agricultural chemicals. According to the Kansas Agricultural Runoff Water Quality Management Plan developed in 1978, every stream in Kansas has too much sediment because of excessive erosion from Kansas cropland.[139] In 1965, western Kansas had 24 manmade lakes with a total of 4,915 surface acres. Due to silting and dewatering, 14 lakes with an original surface area of 4,212 acres had been abandoned (an 86 percent reduction) and fisheries management plans were discontinued by 1979.[140]

Due to diminishing tree cover, the Arkansas River west of Dodge City has lost 50 percent of its riverside habitat while natural sedimentation is inhibiting the fish populations and reducing associated aquatic habitat. This resulted from changes in land use and intensified utilization of surface and stream valley water supplies which have dewatered the river. Between 1972 and 1979 there has been a reduction of 83 percent in the number of miles of the upper Arkansas River in western Kansas that could be fished.[141] The Arkansas River has become an intermittent stream. It is dry enough that a center-pivot irrigation system has been erected across the former river bed in one locality.

Agri-chemical Contamination

Agricultural chemicals, particularly nitrogen fertilizers, have played a major part in increasing agricultural productivity within the state of Kansas. Total commercial fertilizer usage was 909,000 tons in 1979; of this figure, nitrogen use amounted to 640,000 tons; phosphorus 205,000 tons; and potash 64,000 tons.[142] In 1978 about 18.5 million pounds of pesticides were used on Kansas' top five agricultural crops--wheat, corn, grain sorghum, soybeans, and alfalfa. Herbicides were used on 7.1 million acres, insecticides on 4 million acres and fungicides on 3.4 million acres, with an additional 2.5 million acres of rangeland treated with herbicides.[143]

Agricultural chemicals used in such magnitude and over such a large area can create many health and environmental problems. Chemical fertilizers are often used as substitutes for the nutrients that are naturally released in the breakdown of plant and animal material within the soil. Since chemical fertilizers contain very little physical substance, they do not inhibit soil erosion as natural sources do. Chemical fertilizers are also highly soluble and leach from soils to become pollutants. Besides groundwater problems, nitrate levels are increasing in the major streams of Kansas, but are still well below EPA standards for drinking water. Phosphorus exceeds the EPA standards in all major Kansas streams, but fortunately because of low nitrate and oxygen levels, it is in no immediate danger of causing algal bloom in Kansas streams.[144]

Pesticides are an even more serious health hazard. Pesticides that were considered "safe" several decades ago and hailed as a modern miracle are now banned because of their health risks to the environment and humans. DDT and other chlorinated hydrocarbons are being replaced in Kansas by carbamates and organophosphates despite their toxicity and the higher occupational risks involved.[145] Even pesticides that are considered safe if used according to directions will not always be used in that manner and accidental and intentional exposure will occur.

The health of fish in Kansas waters is an indicator of the quality of the environment we live in. In 1981, there were 59 fish kills reported in Kansas and a documented 190,779 fish killed. It is estimated that there were a total of 250,000 reported and unreported fish killed in 1981. Agricultural operations (pesticides, fertilizers, and feedlot runoff) were responsible for 112,000 fish reported killed in 1981 (59 percent of all causes). Feedlots were responsible for the death of 85,000 fish and pesticides for 25,000 fish.[146]

In 1976 when there were problems with the misuse of endrin being aerial-sprayed to control cutworms in south-central Kansas wheat, there were 27 fish kills (65 percent caused by agricultural operations) of which 14 were caused by pesticides. Of the total 141,700 fish that were reported killed that year, 82,700 were killed by pesticides and a significant number of those by endrin. Endrin is now a restricted pesticide, but is still allowed on apples and wheat.[147]

Atrazine accounted for 24 percent of all herbicides used in Kansas in 1978.[148] In a recent University of Kansas study, atrazine introduced into self-contained ponds at rates sometimes found in Kansas waters, was shown to reduce phytoplankton photosynthesis and reduce fish reproduction. Even though at the end of the experiment numbers and size of adult female fish in both the control ponds and atrazine-added ponds were equal, the researchers concluded that atrazine was responsible for the adverse affects and that pollution perturbations, such as herbicides in Kansas waters, can only be revealed by a whole system experiment.[149] Such experiments are rarely used to determine the effects of pollutants.

Agricultural operations that produce fish kills in our streams are a serious threat to our health because these waters often are the drinking source for many of us. The Kansas Department of Health and Environment recognizes this threat and issues Pesticide Alert Bulletins to health administrators. The one for April 16, 1981 stated:

> The Board of Agriculture predicts that insect infestations on crop fields are going to be very high this year. They also expect a tremendous increase in the use of pesticides for the control of these bugs.
>
> Based upon this prediction, we expect an increase in the number of poisoned persons as a result of exposure to these potentially hazardous pesticides.[150]

While this bulletin will help to react to the problem created by agricultural chemicals, it does not deal with the basic use of these substances or solve the problems that they create to the health of people and the environment. A review and analysis that looks at all aspects of the use of agricultural chemicals in the state of Kansas is needed.

THE FARMER: AN ENDANGERED SPECIES?

Economics

The Kansas farmer is economically caught between a rock and a hard place--not a very good place to try to farm. Production has increased dramatically through better technology and farming practices and this is considered the success story of agriculture. But at the same time the countryside has been depopulated, reducing the number of farms and farmers. There were 166,000 farms in Kansas in 1930. This declined to 135,000 in 1950, to 86,000 in 1970, and to 72,000 in 1980. At the same time, average farm size increased from 283 acres in 1930 to 664 acres in 1980, a 236 percent increase.[151]

The net farm income for 1981 totaled $605 million. This was the second of two large consecutive yearly declines and was due to adverse weather, lower prices and high interest rates. Although the net farm proprietor's income in 1981 was only 2 percent of the total state personal income, Kansas farmers spent about $6 billion in production expenses and personal consumption expenditures, a significant portion of the state's economy.[152]

Some of the best farmland in the state is being lost to development. Kansas loses over 36,000 acres of prime farmland per year due to urban sprawl and other non-farm uses. This is more than fifty-six square miles and is about equal to the total acreage of land needed to grow all the climatically adapted fruits and vegetables Kansans consume.[153] Most towns and cities in Kansas are located in river valleys which are prime farmland, and most of them have industrial parks or are building houses or businesses on them. There needs to be some means of protection that would steer towns and cities away from developing lands with the highest agricultural productivity. As one retiring Finney County farmer said after selling 160 acres to the developer of an industrial park: "You get to the point where you can't afford to own it for farming."[154]

Corporate Farming

In 1979 there were 1,864 corporations who reported, as required by law, they owned farmland in Kansas. These corporations owned 5.63 percent of the agricultural land in Kansas--more than double the 1975 figure, when 1,037 corporations owned 2.5 percent of the land. Of the corporations that filed, 87.4 percent were domestic for profit corporations which can loosely be defined as family farm corporations.[155] Family farms incorporate for tax advantages and ease of estate transferal. However, the same incentives which encourage family farmers to incorporate also attract non-farm and absentee corporations, often giving them increased benefits. Very little research has been done on the extent of non-farm and absentee corporate involvement in Kansas agriculture.

The Kansas Corporate Farming Law passed in 1931 was the oldest in the nation, but it was poorly enforced. A new Corporate Farming Law was passed in 1981 which defined family farm corporations, authorized farm corporations, and trusts and added some tough penalties for violators, including a $50,000 fine. However, "authorized farm corporations" can now have up to five shareholders and unlimited amounts of land. Also, there are loopholes that allow feedlots to own an unspecified amount of land needed to run their feedlots and that allow any corporation to own farmland for a "non-farming business."[156] With the loophole in the new corporate farming law, feedlots can own a considerable amount of land for their operations since it takes a lot of feed to fatten all the cattle on a 50,000 head capacity feedlot.

Corporations and individuals from outside of the U.S. owned over 64,000 acres of Kansas' farmland (worth more than $30 million) as of December 31, 1981. The Flint Hills, primarily used for grazing, have the highest foreign investment with 12,000 acres in Greenwood County and 11,000 acres in Butler County owned and controlled by foreigners. Also in southwest Kansas, 4,000 acres were owned by foreigners in Kearny County and 3,000 acres in Stevens County.[157]

Corporate agriculture controls more than just farmland in Kansas. Perhaps the most valuable land in the state are the feedlots of western Kansas. Almost all feedlots are incorporated. They are commercial feedlots, not family farm feedlots, because most of them are not part of a farm operation.

The two largest feedlots in Kansas are Caprock #3 at Leoti and Grant County Feeders Continental Grain Company at Ulysses. They are owned by Cargill and Continental Grain, which are multi-national corporations, and have maximum capacities of 75,000 and 55,000 head respectively. Neither of these two feedlots reported to the Secretary of State's corporation file with the name that they are licensed under at the State Animal Health Department and neither are listed under their parent corporation. Of the 55 largest feedlots in Kansas with a total maximum capacity of 1.2 million head, twelve did not report to the Secretary of State's file. However, it is possible that some may be listed under another name or are not corporations. The fattening of beef cattle in feedlots is the apex of Kansas agriculture in terms of potential profit. Careful monitoring and analysis of this industry is needed.

The Corporate Farming Law has several weak points. First of all, because the reporting act is vague, it is not clear according to records whether a corporation is a family farm corporation or some other type. It should be made clear exactly who owns and operates Kansas farms and feedlots. Secondly, there are no longer any acreage limitations for corporations. This is true for absentee corporations as well. It is also assumed that all family farm corporations are the same regardless of size. Thirdly, although the law has some stiff penalties for violations, there is no provision for adequate enforcement of the law.

Preserving and Rejuvenating the Family Farm

The family farm system of diversified agriculture found in Kansas has a heritage of hard work, dedication, conservation, responsibility, belief in community, and self-reliance. No other system of agriculture, including corporate agriculture, has offered so many advantages to Kansas or has been as productive. And yet we are in the midst of a transition to a corporate, industrialized agriculture that is removing itself from the family farm.

Corporations in and of themselves are not bad. Some family farms have incorporated. However, corporations tend to be very large entities and are usually incorporated for advantages such as tax breaks that are unavailable to small and medium sized operations. The future structure of Kansas agriculture is not clear. If Kansas is to be composed of family farms, then these farmers need to receive active and vocal support. Current tax laws and research may tend to favor the largest operations, those growing away from family farms. One Kansas State University professor stated that he realized he was training a majority of his students for corporate agriculture, but noted that opportunities are limited.

Laws and legislation are intended to create equal opportunities for all. Legislation is needed to bolster family farms in Kansas and check the power and control of the large farm operations--whether multinational or family farm corporations. Research should also support family farms and recognize that there are different scales and different economies for the larger family farms that grow grain and/or raise livestock and the smaller ones that grow speciality crops. They both need attention to help them maintain their viability.

Kansas agriculture and its supporting industries are the foundation of the economic base in Kansas. The 72,000 farms that are still left in Kansas, most of them family farms, plant the seeds for Kansas economic prosperity. It is time to preserve and rejuvenate family farm agriculture in Kansas. The Kansas Department of Economic Development, the Board of Agriculture, and Kansas State University have the resources and ability to promote an agriculture that will once again make the family farm a widespread economically viable production unit for managing the land resource of Kansas.

GOALS OF THE KANSAS FOOD SYSTEM [158]

ABUNDANCE: The food system should give every person access to adequate food--in quantity, quality and degree of choice.

DEPENDABILITY: The food system should provide every person with a reliable food supply--free from social, political, economic, or environmental disruption.

SUSTAINABILITY: The food system should be culturally, environmentally, and technologically sustainable in respect to production and all other aspects of the Kansas food system--including resource inputs, cultivation techniques, processing and distribution.

SAFETY: The food system should not endanger workers, consumers, or the environment.

EFFICIENCY: The food system should incur minimal energy or other resource costs and use biologically produced energy sources rather than fossil fuels when they are compatible with soil conservation practices.

APPROPRIATENESS: The food system should be matched to both the limits and needs of its region and locality.

EQUITABILITY: The food system's benefits should be available for use by all in a fair manner.

WEALTH: The food system should generate sufficient income to rural people to provide a standard of living equivalent to that of other sectors of the economy to maintain vigorous rural communities and to enable farmers to fulfill their land stewardship responsibilities.

FLEXIBILITY: The food system should be open to change, growth, evolution, creativity, and experimentation.

OPENNESS: The food system's organization, patterns of control and course towards the future should be within public view.

ACTIONS TOWARD SUSTAINABILITY

It needs to be recognized that consumers, farmers, legislators, agri-businesses, and researchers are concerned about the Kansas Food System and our environment. All of them are interested and will listen to concerned and informed citizens. Changes can occur when a number of vocal, intelligent, and concerned people take action to change current structures, systems, and practices and also work to create new ones. A list of recommendations follows, suggesting actions that we can take as consumers, farmers, and as citizens and legislators directing state governmental policy.

WHAT WE CAN DO--CONSUMERS

1. Buy Kansas-grown foods--support local growers whenever possible. The Marketing Division of the Kansas State Board of Agriculture is encouraging producers to use the identifying label and registered trademark (see figure Z) "from the land of KANSAS" so that consumers will know that a product is a Kansas product. Buy products that carry this label whenever possible.

2. Go to farmers markets--obtain a copy of "Farm Fresh, A Directory of Kansas Roadside Markets"[159] from your county extension agent for a location of the nearest community and roadside farmers market.

3. Determine food origins--ask your grocers where your food is grown and processed and suggest that they buy local foods. Tell them who is growing foods that they could carry locally. Make petitions requesting them to purchase local, high quality foods in season.

4. Change our diets--consume foods that are more attuned to our seasons, that could be grown in Kansas, and that support Kansas farmers. This would mean buying fresh strawberries, peaches, tomatoes, sweet corn, and other produce when it is in season and making sure that our wheat and bakery products, dairy products, and meat are from Kansas.

5. Become a producer--everyone can grow some of their own food in a garden or a greenhouse, or make a container garden or grow sprouts. Or if space allows, raise backyard animals like chickens or rabbits or fish in a backyard or greenhouse pool or tank. Every little bit helps and it makes us all aware how much time and energy are required to produce food.

6. Support local or regional-owned grocery stores--which will keep more of your money circulating locally. These stores can more easily buy local produce.

7. Join a food cooperative--where you join others and work together to buy your own food together in bulk orders and then divide them. There are presently at least 15 cooperative food buying clubs and storefronts within Kansas.

8. School lunch programs--can be changed by parents who express interest and concern in the diet their children have away from home. Schools can be encouraged and directed to buy local foods.

9. Get acquainted with local farmers--to understand their problems and their work, and to narrow the rural/urban social chasm.

10. Join discussion groups--on various topics of food production and consumption. Churches and other organizations have recently had world hunger and the family farm as topics.

11. Process and preserve more foods--when foods are in season. Excess from your garden or locally purchased produce can be preserved by canning, freezing, drying, or storing in a root cellar. These foods can be used later in the year and are more nutritious, better-tasting and less expensive than those bought at a store.

12. Educate yourself and your children--about the Kansas food system by taking adult education courses on various food and agriculture topics and by requesting that your children's teachers teach them about Kansas agriculture, where their food comes from, and about growing plants and gardening.

WHAT WE CAN DO--FARMERS

1. Consider alternative agricultural practices--such as farming organically or with minimum tillage, diversifying production, and experimenting with a high-value speciality crop.

2. Use alternative forms of energy--practice conservation and reduce energy usage wherever possible, consider a solar grain drier, solar hot water heaters for dairies, better insulation for farm buildings, water-pumping windmills, wind generators for electricity; plant windbreaks and woodlots, use crop wastes as an energy source consistent with soil and water conservation principles. Many farm organizations and Kansas State University have information available on alternative energy sources for the farm and some will also do workshops.

3. Reduce soil erosion--by working with the Soil Conservation Service, State Conservation Commission, and the State Association of Kansas Watersheds. Use farming practices that check soil erosion and build up the soil.

4. Develop on-the-farm fetilizer sources--as the price of nitrogen fertilizers goes up, it becomes more profitable to grow legumes on a wider scale as a supplemental or main source of fertilizer for crops. Promptly recycle animal wastes back to fields.

5. Explore direct marketing channels--sell directly to consumers where possible, or sell directly to local markets or packing plants, and form or join marketing cooperatives to pool commodities.

6. Identify products--as "from the land of KANSAS" with the Marketing Division of the State Board of Agriculture. This registered trademark is available upon written request from them. It is registered with the Secretary of State to ensure that it is used in the appropriate manner. This trademark can be an effective promotional and marketing tool. See Appendix 3 for their address.

7. Join farm organizations--be an organized force when seeking legislation, to create marketing channels, and to share and exchange information and skills.

8. Get to know consumers--educate them on exactly what a farmer does and why, explain the economic situation from your perspective and listen to the consumers problems (the farmer is a consumer too).

9. Request and support--information and research from our land grant college on improved fertilizer use, irrigation management, crop drying methods, alternative energy sources for the farm, local marketing strategies, and any other research that will support and promote family farms and sustainable production in Kansas.

WHAT WE CAN DO--AGRI-BUSINESS AND THE FOOD INDUSTRY

Agri-businesses and the food industry play an important role in the Kansas food system. They can help our food system become more sustainable by considering the following:

1. Request research and support it financially from our land grant college, the state agencies, and elsewhere that will lead us toward a more sustainable food system. This could include developing new products, machinery, and management practices that supplement biological processes and use our natural resources wisely.
2. Support Kansas and the local economy whenever possible to strengthen Kansas communities and to keep monies circulating locally.
3. Develop new products that support a sustainable agriculture and food industry. Examples are: more soil-conserving farm machinery, seeds that are adapted to energy and resource conservative agricultural practices, developing on-farm uses of wind and solar energy, and food products for the local market.
4. Get acquainted with farmers and consumers and solicit their ideas and opinions on ways to be more responsive to their needs and to make our food system more sustainable.

WHAT WE CAN DO--STATE GOVERNMENT

The State Government of Kansas and the Extension Service at Kansas State University can take a much more active role in promoting food self-reliance, a more regional food supply, and in developing a sustainable food system for Kansas. They can do this by providing information and guidance and through specific research and legislation.

The following recommendations will not only strengthen the Kansas food system, but they can also enhance the agricultural and state economies as well.

1. Institutional Food Purchasing

The state of Kansas should require our schools, hospitals, and other food-purchasing institutions to buy foods produced in Kansas when their quantity, quality, and availability are similar to imported foods. This would encourage and stimulate further production of fruits, vegetables, poultry, and fish within our state and would strengthen the connections between local producers and purchasers of meats, dairy products, eggs, and cereal products (including bakery goods). This would increase tax revenues and new jobs would be created. A study is needed to determine exactly how much more we can pay for local production when compared to imports and still improve the state's economy.

The State of Maine passed legislation in 1979 which required within-state purchasing by institutions for similar quality foods if their cost was not more than 3 percent higher than imported foods. It was estimated that by increasing the purchases of Maine-grown foods by in-state institutions by only 10 percent, Maine's gross state product would increase by $233,000, tax revenues would rise by $18,600 annually, and seventeen new $10,00 per year jobs would be added to the state's economy.[160]

Kansas currently imports a significant amount of food it consumes. The Kansas Department of Administration, Division of Purchases has no records of the origin of foods that Kansas institutions buy. They accept lowest bids regardless of origin. In the cases of beef, pork, dairy products, eggs and baked goods it is usually within the state, but other foods are more than likely imported into our state and are a drain on our state's economy. It is not feasible to require institutions to buy only local foods, but it is feasible, practical, and economically advantageous for Kansas institutions to buy Kansas-grown foods that are similar to food imports in terms of price, quality, and quantity, thus supporting Kansas producers. Legislation which gives direction to state institutions requiring them to buy local whenever feasible is needed.

2. Research and Extension--Our Land Grant College

Research and information on dissemination from our land grant college have helped the state to become a leading producer of agricultural commodities. They are also shaping the future of the food system in Kansas and need to be given encouragement and direction to make our food system more self-reliant and sustainable.

The purposes of our land grant college have recently been brought into question. Who are they serving? A conference was held at Kansas State University on this topic and an agricultural economist's reply was that "Land Grant programs in agriculture were designed to serve a decentralized agriculture and the surrounding communities toward which that kind of agriculture is reciprocally supportive".[161] The state of Kansas funded 43 percent of Kansas State University's Agricultural Experiment Station 1980 budget of $25 million. The state should exercise their fiscal and planning control to ensure that our land grant college does serve a decentralized and diversified agriculture in Kansas.

About 7 percent of Kansas State University's Agricultural Experiment Station budget is from private grants.[162] This percentage is small, but its impact is much larger because "a special interest group can fund a research project knowing full well that it will draw on university staff and facilities equivalent to five times the amount of funds it kicks in."[163] However, a recent study of the University of Nebraska Animal Science Department concluded:

> ...on the whole, research at Nebraska and elsewhere is still well settled in the arms of practical science, and serves well the interests of the commercial world. Private grants may not, as some have charged 'dictate' the research agenda. But private funding sources continue to find projects that accommodate their own research needs, while longer term research suffers.[164]

With this in mind, the State of Kansas needs to earmark state funds to support the long-term research needed to give Kansans a more sustainable food system. Specifically, they should mandate an in-depth study by Kansas State University on producing, marketing, and distributing various crops needed in our state to make our food system more self-reliant. They should also require investigation and demonstration of energy-saving and environmentally-sound technologies such as organic farming, on-farm energy production, biological fixation of nitrogen for fertilizer, biological insect control, crop rotations for weed control, local and direct marketing of agricultural products, perennial grains and other alternative crops, and agricultural practices that reduce soil erosion and restore soil health.

OTHER STATE LEGISLATION

The State of Kansas government has a unique opportunity to create progressive agricultural, food, and land policies. The federal government is reducing its activity in the food sector and is placing more of the burden of responsibility on the state. Consequently, the Kansas government must create its own progressive policies to meet the current and future needs of farmers and consumers. The following are actions that can be taken:

1. Preservation of Agricultural Land--Prime farmland should be preserved for future agricultural use through the use of agricultural zoning, formation of agriculture districts, public purchase of development rights, and/or penalties for converting prime farmland to other uses. Maryland has a law that could serve as a model.

2. Assistance for Beginning Farmers--establish a beginning farmer credit assistance program to insure that a new generation of young farmers replaces the older generation. This program should include: 1. loan guarantees or direct loans; 2. a partial interest subsidy; and 3. eligibility requirement ensuring that recipients are qualified to farm and have a net worth below a designated ceiling. Tax credits or financial incentives should be written into tax laws to encourage people to sell their land to beginning farmers. Minnesota has laws that could serve as models.

3. Establish a Kansas Water Use Commission--to monitor water use and depletion across the state, especially in western Kansas, and to make recommendations on the evolving regional water policy. Members of the five groundwater management districts, the Agricultural Board's Division of Water Resources, the Kansas Water Authority, the Kansas Geological Survey, and an environmental organization should comprise this board.

4. Pesticide Legislation--is needed to protect Kansas residents. The legislature should consider the following issues: 1. Recovery of damages

from pesticides should not be prohibited because of the failure to file a pesticide damage claim within 60 days of the discovery of pesticide damage; 2. All applicators should be trained and taught the associated hazards of pesticides to people, crops, animals, and the environment; 3. All pesticide businesses and their offices should be licensed; 4. Insurance should be made mandatory to cover pesticide damage; 5. Increase funding for the staff of the Weed and Pesticide Division of the Board of Agriculture to monitor accidents and misuse and to enforce the law; 6. Research should be undertaken that accurately weighs and quantifies the negative impact of pesticides on the Kansas environment.

5. Strengthening the State Conservation Commission--by increasing its funding to insure cost sharing money for soil and water conservation projects and to replace federal support of conservation programs as those funds are cut.

6. Corporate Reporting Law--should be strengthened to require corporations to file according to legal definitions to determine if they are family farm corporations, local corporations, or non-resident corporations. The law should be strengthened to limit non-resident corporations from becoming further involved in Kansas agriculture, and give absolute acreage limitations for all corporations.

7. Organic Certification Standards--should be enacted to enhance the ability of organic producers in Kansas to sell their products as organic products. Such a program would also protect consumers who want assurance that a product labeled organic is really organically-grown.

8. A Direct Marketing Program--should be established by the Board of Agriculture to promote the sale of Kansas-grown meat, dairy products, eggs, fruits, and vegetables directly to consumers. Existing city markets, shopping malls, large parking lots, stadiums, and fairgrounds can be turned into markets where Kansas farmers can sell their products. The Marketing Division of the Board of Agriculture should be given additional funding to further identify products, "from the land of KANSAS". West Virginia has a direct marketing program that could serve as a model for Kansas.

9. Crop Bounties--could be paid to Kansas farmers to encourage the production of new and speciality crops, especially fruits or vegetables. These bounties could be similar to those established by the state legislature in 1903 when they paid a two cent per pound bounty for all sugar beets produced within the state in order to establish the sugar beet industry in Kansas.

10. Severance Taxes--on excessive soil loss and water usage should be considered as a way to make sure our resources are available for future Kansans.

11. Develop an Emergency Food Plan--for the State of Kansas to be able to effectively respond to extreme crop failure, disruption of the transportation system, or disaster.

CONCLUSION

The Kansas food system is extremely productive and produces more food than Kansans can consume. However, it is not sustainable and does not always meet the food needs of Kansans. There are many creative and positive actions that we can take as consumers, producers, businesses, and as determiners of governmental policy to develop a sustainable Kansas food system. Appropriate use and control over our own agricultural and food resources are essential for the health of our economy, culture, and our own bodies. Everyday and into the future, food and agriculture are necessary to sustain us.

Figure Z

from the land
of KANSAS

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APPENDIX 1

Kansas has an agricultural heritage to be proud of. Long considered the breadbasket of the United States, Kansas has produced not only important grain crops, but also apples, potatoes, sweet potatoes, cowpeas, peaches, canteloup, watermelon, sheep, chickens, and turkeys. Today, the production of five crops -- wheat, sorghum, corn, alfalfa, and soybeans -- accounts for 95 percent of the harvested value of all Kansas crops. Kansas ranks first in the United States for production of wheat, fourth for cattle and calves, eighth for hogs, and eleventh for corn grain.

Although agriculture is Kansas' biggest and most important business, there are problems facing future agricultural production. Sixteen million acres of land are eroding at rates higher than the "acceptable" rates of two to five tons per acre. Irrigation water withdrawals continue to exceed the aquifers' recharge rates, threatening not only the future availability of irrigation water, but also the quality of water in Kansas. The Kansas food system requires many changes to make it an abundant, safe, economical, sustainable source of food for all Kansans. These changes include more research in low input agriculture, more efficient use of water, more food processing facilities for Kansas-grown foods, and a statewide network of food producers, processors, retailers, and consumers.

Retail value of KS production	5,648,917,800
Retail value of KS exports	4,368,017,600
Value of production remaining	1,280,900,200

59% of consumption produced in KS

Kansas imports 41% of its food.

KANSAS FOOD IMPORTS

	PRODUCTION		CONSUMPTION								
COMMODITY	Production Retail Weight[a] (1,000 lbs)	Retail Value[b] ($1,000) (1980 dollars)	Consumption in Kansas[e] (1,000 lbs)	Retail Value[b] ($1,000) (1980 dollars)	% Import	Retail Value of Import ($1,000)	% Export	Retail Value of Export ($1,000)	Acres Cropland Used in KS Production	Acres required to produce 100% of Kansas Consumption[bb]
Meats										
Beef	1,595,312.0	3,509,686.0	180,198.5	396,436.7			88.7	3,113,249.4	3,932,963.0[d,z]	444,424.9[d,z]
Veal	59.0	200.0	3,533.3	11,977.9	98.3	11,777.9		NC	NC	NC
Lamb & Mutton	6,170.9	19,685.4	3,062.2	9,768.4			50.4	9,917.0	12,944.9[d,z]	6,420.7[d,z]
Pork	257,241.0	486,185.5	160,883.1	304,069.0			37.5	182,116.4	634,819.5[z]	461,686.9[z]
Grains[e]										
Wheat flour	3,278,500.0[f]	917,980.0	273,948.8	76,705.7			91.6	840,869.7	1,561,190.0[g]	131,140.0
corn	NC[h]		37,217.4	16,340.3						7,070.2
Oats	0.0		7,302.2	4,965.5	100.0	4,965.5				6,005.1
Rye	0.0		1,648.9	643.1	100.0	643.1				1,402.1
Rice	0.0		21,906.5	5,914.8	100.0	5,914.8				NA
Barley	0.0		2,866.6	1,385.0	100.0	1,385.0				1,436.3
Popcorn	8,990.0	9,619.3	5,856.8[aa]	6,266.7			30.3	2,723.3	4,200.0	2,736.8
Poultry[j]										
Chicken	8,566.1[j]	5,018.9	117,776.8	69,488.3	92.8	64,469.4			5,250.5[i,j]	74,923.4[i,j]
Turkey	2,428.8[j]	2,404.5	24,733.1	24,485.8	90.2	22,081.3			8,741.0[j]	89,193.9[j]
Eggs	55,747.0[j]	35,678.1	81,501.5	52,161.0	31.6	16,482.9			76,214.4[j]	111,424.5[j]
Fish										
Finfish	2,019.8	3,234.1								
Shellfish	0.0									
Total fish	2,019.8	3,234.1	29,915.3	52,052.6	93.8	48,818.5				

continued on next page

KANSAS FOOD IMPORTS (continued)

	PRODUCTION		CONSUMPTION							
COMMODITY	Production Retail Weight[a] (1,000 lbs)	Retail Value[b] ($1,000 lbs) (1980 dollars)	Consumption in Kansas[e] (1,000 lbs)	Retail Value[b] ($1,000) (1980 dollars)	% Value	Retail Value of Import ($1,000)	% Export	Retail Value of Export ($1,000)	Acres Cropland Used in KS Production	Acres required to produce 100% of Kansas Consumption[bb]
Wild Game[k]										
Deer	1,442.2[k]	1,730.9	NC							
Pheasant	1,944.0[ee]	2,507.8	NC							
Quail	296.5[ee]	382.5	NC							
Duck	400.0[ee]	516.0	NC							
Dairy Products										
Fluid Milk and Cream	546,530.3	153,028.5	537,062.2	150,377.4			1.7	2,651.1	150,648.3[l]	148,130.1[l]
Cheese & Cottage Cheese	52,400.0	99,036.0	52,057.3	98,388.3			0.6	594.2	90,147.3[l,m]	89,606.4[l,m]
Butter	16,351.0	26,652.1	10,364.4	16,894.0			36.6	9,758.1	81,509.1[l,m]	51,676.8[l,m]
Condensed & Evaporated milk	NC		16,724.3	9,700.1						
Dry Whole & Nonfat Milk	NC		15,782.1	26,829.6						
Ice cream & Ice Milk	53,948.0	41,005.5	60,537.3	46,008.3	10.9	5,007.8			35,672.8[l,m]	39,561.1[l,m]
Vegetables - fresh										
Artichokes	0.0[o]	0.0	706.7	452.2	100.0	452.2			0.0	NA[n,o]
Asparagus	insignificant[o]		706.7	1,229.7	99.9	1,229.7			0.0[o]	176.7
Beans, snap	1,000.0[o]	840.0	3,062.2	2,572.2	67.3	1,732.2			100.0[o]	612.4
Broccoli	0.0[o]	0.0	4,004.4	2,883.2	100.0	2,883.2			0.0[o]	364.0
Cabbage	7,350.0[o]	2,131.5	19,786.5	5,738.1	62.8	3,605.6			350.0[o]	942.2
Carrots	0.0	0.0	14,368.8	5,029.1	100.0	5,029.1			0.0	410.5
Cauliflower	0.0	0.0	3,062.2	2,357.9	100.0	2,357.9			0.0	204.1
Celery	0.0[o]	0.0	17,195.4	8,425.7	100.0	8,425.7			0.0[o]	NA[n]
Cucumbers	408.0[o]	322.3	9,422.5	7,443.5	95.7	7,121.1			85.0[o]	1,963.0
Eggplant	850.0	646.0	1,177.8	895.1	27.8	249.1			85.0[o]	117.8
Garlic	0.0	0.0	1,648.9	6,678.0	100.0	6,678.0			0.0	103.0

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KANSAS FOOD IMPORTS (continued)

COMMODITY	PRODUCTION Production Retail Weight[a] (1,000 lbs)	Retail Value[b] ($1,000) (198 dollars)	CONSUMPTION Consumption in Kansas[e] (1,000 lbs)	Retail Value[b] ($1,000) (198 dollars)	% Value	Retail Value of import ($1,000)	% Export	Retail Value of Export ($1,000)	Acres Cropland Used in KS Production	Acres required to produce 100% of Kansas Consumption[bb]
Green Peppers	1,700.0[o]	1,666.0	7,773.3	7,617.8	78.1	5,951.8			85.0	388.7
Lettuce	0.0	0.0	58,652.8	34,605.1	100.0	34,605.1			0.0	1,675.8
Onions	1,500.0	735.0	24,026.5	24,026.5	93.7	11,038.0			50.0	800.9
Potatoes	31,350.0	7,524.0	116,127.9	27,870.7	73.0	20,346.7			1,650.0[y]	6,112.0
Spinach	1,250.0	1,487.5	1,648.9	1,962.2	24.2	474.7			250.0	333.0
Sweet Corn	9,751.5	3,900.6	15,546.5	6,218.6	37.2	2,318.0			3,000.0	4,782.8
Sweet Potatoes	15,400.0	6,006.0	8,008.8	3,123.4			47.0	2,882.6	800.0	416.0
Tomatoes	2,200.0	1,298.0	26,853.1	24,704.9	94.7	23,406.9			110.0	1,342.6
Turnips	17,500.0	5,075.0	NC		some				700.0	NC
Vegetables- canned & frozen										
Asparagus	NC		848.0	1,199.9						69.7[o]
Beans, snap	NC		16,959.8	6,515.4						2,227.9
Beans, Lima	NC		1,813.8	1,506.6						NA[n]
Beets	NC		2,826.6	1,074.1						109.6
Broccoli	NC		3,297.7	2,902.0						250.0
Brussell sprouts	NC		588.9	954.0						NA
Carrots	NC		3,368.4	1,659.2						62.7
Cauliflower	NC		1,083.5	1,560.2						60.2
Onions	NC		1,601.8	881.0						45.3
Peas	NC		4,569.7	3,228.5						922.4
Pickles (cucumber)	NC		16,253.2	16,903.3						2,519.0
Potatoes	NC		56,532.9	43,344.3						1,370.2
Pumpkin/Squash	NC		942.2	452.3						14.5
Sauerkraut	NC		2,826.6	1,215.4						72.4
Spinach	NC		2,944.4	1,720.0						614.7
Sweet Corn	NC		18,208.3	10,057.0						8,930.6

continued on next page

KANSAS FOOD IMPORTS (continued)

COMMODITY	PRODUCTION Production Retail Weight[a] (1,000 lbs)	Retail Value[b] ($1,000) (1980 dollars)	CONSUMPTION Consumption in Kansas[c] (1,000 lbs)	Retail Value[b] ($1,000) (1980 dollars)	% Value	Retail Value of Import ($1,000)	% Export	Retail Value of Export ($1,000)	Acres Cropland Used in KS Production	Acres required to produce 100% of Kansas Consumption[bb]
Sweet Potatoes	NC		2,355.5	1,766.6						158.1
Tomatoes										
Whole	NC		14,368.8	7,759.2						154.2
Catsup, Paste	NC		28,502.0	24,796.7						305.9
Puree	NC		1,884.4	527.6						20.2
Tomato and Vegetable Juices	NC		7,537.7	2,864.3						80.9
Fruits, fresh										
Apples	23,100.0[ff]	9,009.0	37,688.6	14,698.5	38.7	5,689.4			1,800.0[ff]	2,936.8[ff]
Apricots	0.0	0.0	235.6	327.5	100.0	327.5			0.0	18.8[q,ff]
Avocados	0.0	0.0	1,884.4	1,940.9	100.0	1,940.0				NA
Bananas	0.0	0.0	48,995.1	17,638.2	100.0	17,638.2				NA
Cantaloup	10,800.0[ff]	4,212.0	15,546.5	6,063.1	30.5	1,849.3			450.0[ff]	1,036.4[ff]
Cherries	120.0[ff]	130.8[r]	1,413.3	1,540.5	91.5	1,409.6			20.0[r,ff]	188.4[r,ff]
Citrus fruits	0.0	0.0	65,483.9	23,143.2	100.0	23,143.2				NA
Grapes	insignificant	0.0	8,479.9	8,395.1	99.9	8,386.7			0.0	997.6[ff]
Nectarines	insignificant	0.0	3,768.9	4,485.0	99.9	4,480.0			0.0	301.5[ff]
Peaches	8,640.0[ff]	10,281.6	12,719.9	15,136.7	32.0	4,843.7			300.0[ff]	441.7[ff]
Pears	insignificant	0.0	5,653.3	2,939.7	99.9	2,936.7			0.0	452.3[ff]
Pineapples	0.0	0.0	3,297.7	1,220.1	100.0	1,220.1				NA
Plums	insignificant	0.0	3,523.3	2,084.6	99.9	2,082.5				282.7[ff]
Strawberries	1,080.0[ff]	961.2	3,297.7	2,935.0	67.2	1,972.3			240.0[ff]	732.8[ff]
Watermelon	16,200.0[ff]	2,430.0	24,262.0	3,639.3	33.2	1,208.2			450.0[ff]	673.9[ff]
Fruits, processed										
Canned fruit	NC		40,986.3	22,952.3						NC
Fruit juice, chilled & canned	NC		54,483.5	19,069.2						NC

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KANSAS FOOD IMPORTS (continued)

COMMODITY	PRODUCTION Production Retail Weight[a] (1,000 lbs)	Retail Value[b] ($1,000) (198 dollars)	CONSUMPTION Consumption in Kansas[e] (1,000 lbs)	Retail Value[b] ($1,000) (198 dollars)	% Value	Retail Value of Import ($1,000)	% Export	Retail Value of Export ($1,000)	Acres Cropland Used in KS Production	Acres required to produce 100% of Kansas Consumption
Dried fruit	NC		6,925.3	12,742.5						NC
Frozen fruit	NC		29,844.6	35,813.5						NC
Legumes, Nuts and Oils										
Soybeans: grits & flour	NC[s]		4,711.1	2,025.8					NC	4,758.7
Beans, dry	33,600.0	12,096.0	15,311.0	5,512.0			54.4	6,584.0	24,000.0	11,778.0
Field peas, dry	0.0	0.0	942.2	329.8	100.0	329.8			0.0	588.9
Coconuts	0.0	0.0	942.2	2,054.0	100.0	2,054.0				NA
Peanuts	0.0	0.0	14,368.8	24,570.6	100.0	24,570.6				7,184.4
Pecans	2,300.0[t]	10,325.0	848.0	3,502.2			66.0	6,822.7	3,500.0	2,442.8
Sunflower seed	45,000.0[u]	NC							30,000.0	NC
Other nuts	insignificant	0.0	3,156.4	8,806.4	99.9	8,797.5				
Soybean oil	244,035.0	244,035.0	53,470.0	53,470.0			78.1	190,564.3	1,450,000.0	317,550.0
Lard	19,224.7[v]	13,265.0	5,888.8	4,063.3			69.4	9,201.8		0.0
Margarine	NC		26,382.0	21,897.1						
Shortening	NC		43,106.3	26,294.8						
Sweeteners										
Refined sugar	49,079.8[x]	12,269.9	196,922.8	49,230.7	75.1	36,960.8			15,000.0	59,441.5
Corn Syrup	NC	NC	9,422.8	7,160.8					NC	NC
Honey	2,150.0	2,558.5	2,826.6	3,363.6	23.9	805.1			0.0	0.0
Molasses	0.0	0.0	471.1	659.5	100.0	659.5			0.0	0.0
Other sweetners	NC	NC	20,964.2	16,561.7						NC
Beverages										
Coffee	0.0		18,373.7	36,562.7	100.0	36,562.7			0.0	NA
Tea	0.0		1,884.9	8,347.9	100.0	8,347.9			0.0	NA
Cocoa	0.0		6,124.4	21,619.1	100.0	21,619.1			0.0	NA
TOTALS	6,434,135.8	5,667,777.0	2,962,577.7	2,180,376.9		539,291.50		4,377,934.6	8,127,325.8	2,117,380.4

FOOTNOTES

a. Retail weight for Kansas production are taken from the 64th Annual Farm Facts, Kansas State Board of Agriculture, 1981 and converted where necessary using USDA Conversion figures.

b. Sources for prices: Food-for-Less, Lawrence, KS; Dillon's, Lawrence, KS (2/51/82); and U.S. Department of Labor Statistics.

c. Consumption in Kansas is based on United States per capita figures in Food Consumption, Prices, and Expenditures, 1960-1980, Statistical Bulletin 672, USDA, 1981.

d. This is the number of cropland acres needed to grow the crops to feed the livestock. It does not include rangeland or pasture.

e. The Kansas food exports and imports chart lists only grain that Kansans eat directly as grain, cereal, flour, or bread.

f. Only flour production, bulghur, wheat germ, and other cereal products are milled in Kansas, but statistics are not available.

g. Only acreage required for flour production.

h. Two large corn mills make Kansas an exporter of corn food products, consumption of corn figures not added to totals.

i. Acreages for broiler production only; old hens which become soup, etc. are counted under egg production.

j. 1981 production statistics and feed rations from Al Adams, Department of Animal Science and Industry, Kansas State University.

k. Production statistics in numbers of head from Mike Cox and Marvin Craft, Kansas Fish and Game, Pratt, KS (1980 statistics).

l. Feed rations determined with the help of Dick Dunham and Ed Call, Dairy Science Extension Specialists, Kansas State University and from KSU Dairy Extension News 1980 Annual Summary, Nov.-Dec. 1980, Vol. (1) 6.

m. USDA, Dairy, Dairy Products Annual Summary, 1980, Crop Reporting Board, Economic and Statistical Service, June 1981. This gives a conversion factor from dairy products to raw milk (needed for calculations).

n. Production of these crops not suitable to Kansas due to climate or soils.

o. Production figures and yields per acre for all vegetable crops from James Greig, Horticulture Department, Kansas State University.

p. Kansas is one of the leading turnip-producing states.

q. Apricot production in Kansas is unreliable.

r. These are tart cherries, no sweet cherries are grown in Kansas, production is unreliable.

s. There are two commercial plants that make soy flour.

t. Mostly native pecan groves, Frank Morrison, Horticulture Department, Kansas State University.

u. Jim Shroyer, Agronomy Department, Kansas State University.

v. Livestock and Meat Statistics, Supplement for 1978, USDA gives the figure of .054 times liveweight equals lard production.

w. Acres are credited under pork production.

x. Kansas produced 400,000 lbs. of sugar beets; 8.15 lbs. of beets equals 1 pound of refined sugar, USDA Agricultural Statistics, 1980, p. 77.

y. A portion of this production and acreage is sent to potato processing plants.

z. Determined with the help of Jack Riley, Animal Science and Industry Department, Kansas State University.

aa. Popcorn Institute 111 E. Wacker Drive, Chicago, Illinois.

bb. Determined by dividing production by lbs./bushel, then bushels per acre (average yield for 1980), and conversion of fresh to processed using conversion factors.

cc. Mike Cox, Kansas Fish and Game, Pratt, Kansas.

dd. Mike Burns, Marketing Division, Kansas State Board of Agriculture, Topeka, KS.

ee. Number of pheasant, quail, and duck harvest in 1980 converted to dressed, retail weight by using figures from The Complete Kitchen Guide by Lillian Langseth-Christensen and Carol Smith (Grosset and Dunlap, New York).

ff. Fruit production and yields per acre from Frank Morrison, Horticulture Department, Kansas State University.

APPENDIX 2

GRAINS AND MISCELLANEOUS FOOD CROPS, PRODUCTION AND USE

COMMODITY	Acres[a] Harvested	Farm Value[a] ($1,000)	Yield/Acre[a] (bushels) *	% acres potentially for direct human[b] consumption in KS	% fed to livestock	% of total utilized in KS	% Export to foreign countries	Total Production (bushels)[a]
Wheat	12,000,000	1,617,000	35.0	1.0	25.0[c]	5.9[d]	66.7[c]	420,000,000
All Corn	1,713,000	480,269						
Corn, grain	1,240,000	396,304	94.0	0.6	80.5[f]	75.1[g]	3.1[h]	116,560,000
Corn, silage	426,000	83,965	9.0	0.0	100.0	100.0	0.0	3,834,000
Oats	120,000	8,664	38.0[e]	3.4	99.0	99.0	0.0	4,560,000
Barley	59,000	5,685	41.0	2.4	100.0	100.0	0.0	2,419,000
Rye	10,000	504	21.0	1.4	100.0	100.0	0.0	210,000
All sorghums	4,400,000	554,595		0.0	100.0			
Sorghum, grain	3,640,000	460,169	43.0	0.0	97.0[j]	59.3[i]	17.6[i]	156,520,000
Sorghum, silage	305,000	52,430	9.0 tons	0.0	100.0	100.0	0.0	2,745,000 tons
Sorgum, forage	455,000	41,996	26.0 tons	0.0	100.0	100.0	0.0	1,183,000 tons
Soybeans	1,450,000	181,830	16.5	22.2[k]	82.0[l]	85.0[m]	8.6[n]	23,925,000
Sugar Beets	15,000	6,280	13.5 tons					202,000 tons
Popcorn	4,200	859	2,140.0 lbs.	65.2%	0.0	65.2%	some	8,990,000 lbs.
All hay	2,200,000	255,915	1.92 tons	0.0	100.0	100.0	0.0	4,230,000 tons
Alfalfa hay	1,000,000	174,758	285.0 tons	0.0	100.0	100.0	0.0	2,850,000 tons
All other hay	1,200,000	81,157	1.15 tons	0.0	100.0	100.0	0.0	1,380,000 tons
Dry beans	24,000	12,096	1,300.0 lbs.	54.4	0.0	54.4	some	33,600,000 lbs.
Totals	302,261,200	4,414,476		15,733,011				

*except as noted

Footnotes

a. *64th Annual Report and Farm Facts*, Kansas State Board of Agriculture.

b. Number of acres required for production of 1980 Kansas consumption divided by 1980 total acres harvested.

c. Communication with John Dukelow, Agricultural Markets Specialist, Kansas Wheat Commission.

d. Calculated: 25% of wheat when milled (the bran and germ) becomes cattle feed; 82,381,000 bu. of wheat ground in Kansas, plus Kansans flour consumption.

e. Small amount of our oat crop is shipped to St. Joseph, Missouri and elsewhere to make oatmeal, etc.

f. Using feeding rations from Kansas State University, cattle, hogs, sheep, poultry, dairy, cows, and turkeys consume 69,469.8 bu. of corn = 59.6%; plus livestock and poultry feed account for 84% of domestic use (*U.S. Corn Industry*,by Leath, Myer and Hill, USDA Economic Report #479) or 84% of the 24.9% that is shipped out of Kansas = 20.9%; Grand total is 80.5%

g. *Corn Movements in the United States*, Leath, Hill and Fuller, North Central Regional Research Bulletin #275, Agricultural Experimental Station, University of Illinois, 1977.

h. In 1977 Kansas had 0.3% of the United States total of corn moving to export regions. (*Corn Movements in the United States*)= 5,052,000 bushels = 3.1% for 1977.

i. Calculated from *Sorghum Movements in the United States*, Leath, Hill and Fuller, North Regional Research Bulletin #272, Agricultural Experimental Station, University of Illinois, 1977.

j. There is a sorghum mill in Kansas which uses the flour for industrial purposes to make wallpaper paste.

k. Kansans consume 22.7 lbs./person soybean oil and 20 lbs. soy flour/person per year (*Food Consumption, Prices Expenditures*, USDA, 1981). Oil outturn for soybeans is 17.9% (*Conversion Factors and Weights and Measures*, USDA Statistical Bulletin #616, p.36)

l. Almost all soybeans are crushed for oil, extraction is 17.9% (*Conversion Factors and Weightsand Measures*, USDA Economic Statitical Bulletin #616, p. 36.) The remaining meal becomes livestock feed.

m. Estimate based on use of four large soybean mills in Kansas producing 435,554,000 lbs. of oil in 1980 (*64th Annual Farm Facts* and *Soybean Movements in the U.S.* by Leath, Hill and Fuller, North Central Regional Research Publication #273, Agricultural Experimental Station, University of Illinois, January, 1981.

n. Determined from Soybean *Movements in the U.S*. for Kansas and Nebraska provided .8% of U.S. total. Kansas production was 40.9% of the two state total = 2,067,349 bu. = 8.6% Kansas production.

APPENDIX 3

Kansas Food System Organizations

There are many organizations which directly or indirectly are working toward developing a sustainable food system in Kansas. The following is a selective list of organizations working with consumers, farmers, and the food industry in Kansas.

American Agriculture Movement
Leonard E. Cox, State Coordinator
Weskan, KS 67762

Appropriate Technology Center
Ken Lassman
1101½ Massachusetts St.
Lawrence, KS 66044
(913) 841-3086

Association of Milk Producers, Inc.
Jim Moore, Kansas Division Manager
1601 S. Sheridan
Wichita, KS 67213
(316) 942-2251

Committee of Kansas Farm Organizations
John O. Miller, Legislative Agent
5230 W. 24th St.
Topeka, KS 66614
(913) 272-1745

Conservation Commission
Kenneth Kern, Executive Secretary
535 Kansas Ave., 10th Floor
Topeka, KS 66603
(913) 296-3600

Extension Agents Association
Lila M. Abercrombie, President
Salina County Extension Office
300 West Ash
Salina, KS 67401
(913) 827-3651

Farmers' Newsline
(toll free information number)
(800)-424-7964

From Swords To Plowshares
LaVonne Platt
Box 347
Newton, KS 67114

Grassland Heritage Foundation
Sally Delwiche
5450 Buena Vista
Shawnee Mission, KS 66205

House Agriculture & Livestock Committee
William M. Beezley, Chairman
Kansas Legislature
State Capitol, Room 446-N
Topeka, KS 66612

Kansans for Safe Pest Control
Terry Shafer
R.R. #3
Lawrence, KS 66044
(913) 843-1348

Kansas Area Watershed Council
Dan Bentley
1101½ Massachusetts St.
Lawrence, KS 66044
(913) 842-4418

Kansas Association of Agricultural Agents
Joseph Smith, President
Montgomery County Extension Office
115 S. Sixth
Independence, KS 67301
(316)331-2690

Kansas Association of Corn Growers
Earl Foote, President
RFD #1
Bucyrus, KS 66013

Kansas Association of 4-H Agents
David E. Kehler, President
Cherokee County Extension Office
.O. Box 148
Columbus, KS 66725
(316) 429-3849

Kansas Association of Future Farmers of America
Holton Hall
Kansas State University
Manhattan, KS 66506
(913) 532-5535

Kansas Association of Conservation Districts
Clinton E. Lundquist
Rt. 2, Box 65
Lindborg, KS 67456
(913) 227-3122

Kansas Cooperative Council
Hal Hellbust, Secretary
700 Kansas Ave.
Topeka, KS 66603
(913) 233-4085

Kansas Crop Improvement Association
Lowell A. Burchett, Secretary/Treasurer
205 Call Hall
Kansas State University
Manhattan, KS 66506
(913) 532-6118

Kansas Extension Home Economists
Margaret Hund, President
Jackson County Extension Office
Courthouse
Holton, KS 66436
(913) 364-4125

Kansas Farm Bureau
John Junior Armstrong, President
2321 Anderson
Manhattan, KS 66502
(913) 537-2261

Kansas Farmers Union
Ivan Wyatt, President
P.O. Box 1064
McPherson, KS
(316) 274-4227

Kansas Friends of the Earth
Neil Shanker
730 Fremont
Manhattan, KS 66502

Kansas Pork Producers Council
Doyle Talkington,
Executive Vice President
2601 Farm Bureau Road
Manhattan, KS 66502
(913) 776-0442

Kansas Poultry Association
A.W. Adams, Secretary/Treasurer
P.O. Box 663
Manhattan, KS
(913) 539-5441

Kansas Meat Processors Association
Gilbert Kaiser, President
Kaiser's Meat Processing
216 E. Avenue S.
Lyons, KS 67554
(316) 257-3031

Kansas Natural Resource Council
Gary Kannenburg
5130 Mission Road
Shawnee Mission, KS 66205
(913) 362-5933

Kansas Organic Producers
Jim Lukens
Rt. 3
Beloit, KS 67420
(913) 738-3866

Kansas Rural Center
Fred Bentley
P.O. Box 133
Whiting, KS 66552
(913) 873-3431

Kansas Sheep Association
Clifford Spaeth, Secretary
Animal Science Department
Weber Hall
Kansas State University
Manhattan, KS 66506
(913) 532-6131

Kansas Soybean Association
Verlin Peterson, Secretary
Department of Extension Agronomy
207 Waters Hall
Kansas State University
Manhattan, KS 66506
(913) 532-5776

Kansas State Grange
Edward F. Moody, Master
16851 W. 183rd St.
Olathe, KS 66061
(913) 686-3506

Kansas Wheat Improvement Association
Thomas C. Roberts, President
404 Humboldt
Manhattan, KS 66502
(913) 776-6348

Mid-America Dairymen, Inc
Jack Greenwell, Manager
Kansas City Operations
5200 E. 45th St.
Kansas City, Missouri 64130
(816) 921-2692

Milk Producers Marketing Company
Adolph Olson, Manager
Box 505
Lawrence, KS 66044
(913) 843-5511

The Land Institute
Wes and Dana Jackson
Rt.3
Salina, KS 67401
(913) 823-8967

National Agrimarketing Association
8340 Mission Road
Prairie Village, KS 66206

National Farmers Organization of Kansas
Paul Nauer, President
Jennings, KS 67643
(913) 678-2607

National Parks and Conservation Association
Steve Burr
Rt. 2
Salina, KS 67401

New Destiny Federation
Regional Representative
Diane Luber
The Community Mercantile Food-Coop
700 Maine Street
Lawrence, KS 66044
(913) 842-1203

PRAXIS
Carol Mollner
1620 South 37th St
Kansas City, KS 66106
(913) 236-8336

Sierra Club
Mike Martin
R.R. #2, Box 170
Derby, KS 67037

Small Farm Energy Project
Center for Rural Affairs
P.O. Box 736
Hartington, NE 68739
(402) 254-6893

State Board of Agriculture
901 Kansas
Topeka, KS 66612

United Farm Wives of America
Jeanne Mertz, President
Route 3, Box 260
Manhattan, KS 66502
(913) 456-9605

University for Man Community Gardens
1221 Thurston
Manhattan, KS 66502
(913) 532-5866

Vocational Agriculture
Les Olsen, Supervisor
State Department of Education
120 E. 10th St.
Topeka, KS 66612

Western Kansas Coalition for Clean Water
2921 Ash St.
Hays, KS 67601

Wheat Commission
Steve Graham, Administrator
1021 N. Main St.
Hutchinson, KS 67501
(316) 662-0273

Women Involved in Farm Economics
Peggy Arensmen
R.R. #1
Kinsley, KS 67547

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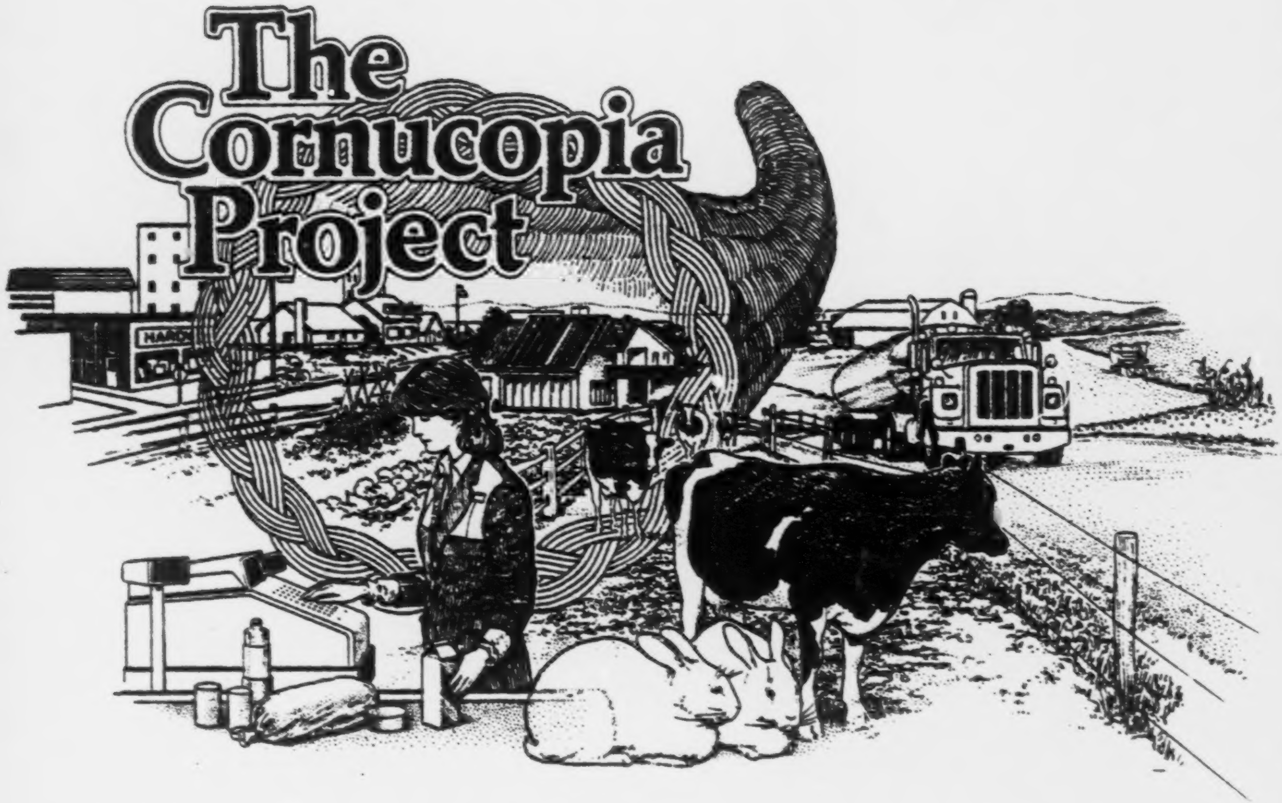

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Table of Contents

Introduction i
The Frightening Facts 1
What Do These Facts Mean? 13
What Can We Do? 14
Recommendations—The State 21
Recommendations--Counties and Cities 29
Recommendations--Consumers 31
Recommendations--Producers 31
Conclusion 33
Footnotes 34
Appendix 41
Florida State Food Imports Chart 42
Footnotes to Imports Chart 49

Introduction

The Florida peninsula dips like a crooked thumb into the warm waters of the Gulf of Mexico and the Atlantic Ocean. Its sandy soils are low in natural fertility and its subtropical climate is a haven for pests and diseases. Recently, if it hasn't been a dry year it's been a cold one.

Yet, despite these drawbacks, this odd-looking state produces 70 percent of the citrus and 19 percent of the sugar in the nation.[1] In addition, Florida ranks second to California in the production of vegetables and is the top domestic producer of winter vegetables to the Northeastern United States.[2] Six of the top 100 agricultural counties are located in Florida.[3] All together, the state leads the nation in the production of over fifteen agricultural commodities[4] and ranks twentieth in export sales.[5]

The pillars that uphold Florida's agriculture, however, are beginning to crumble. Each crack in the system widens as we increase our dependence on non-renewable fuels and resources. These discoveries warrant immediate concern:

* Over 60 percent of the food we eat is produced outside the state.[6]

* We spend nearly $5 billion every year on food from outside the state; transportation of this food into Florida alone costs us nearly $250 million.[7]

* Farmland acreage has declined 27 percent over the past 25 years (Miami alone has taken over 53,000 acres of farmland).[8]

* The state's infertile, porous soil requires seven times more fertilizer per acre than the national average.[9]

* Florida has been suffering through a decade of sparse rainfall as water supplies face dangers of contamination and depletion.

* Foreign competition for fruit and vegetable marketing is a threat to Florida growers as countries like Mexico and Brazil sell their produce at extremely low prices.

* Approximately 8.6 percent of Florida farms control more than three-fourths of the total farm acreage.[10]

* Florida is the second highest pesticide user in the country.[11]

* Florida's phosphate production accounts for 75 percent of the national total, yet scarcity is feared within 20 years.[12]

* Florida imports more than 90 percent of all energy used in the state.[13]

Many of these problems are occurring across the country and around the world. Every day, while the U.S. population grows by 5,000, the nation loses the productive equivalent of 25 square miles of agricultural land to erosion and farmland development. In addition, repeated heavy applications of chemicals and continuous single-cropping are destroying the fertility of our soil, and the supply of fertilizer materials is depleting rapidly.

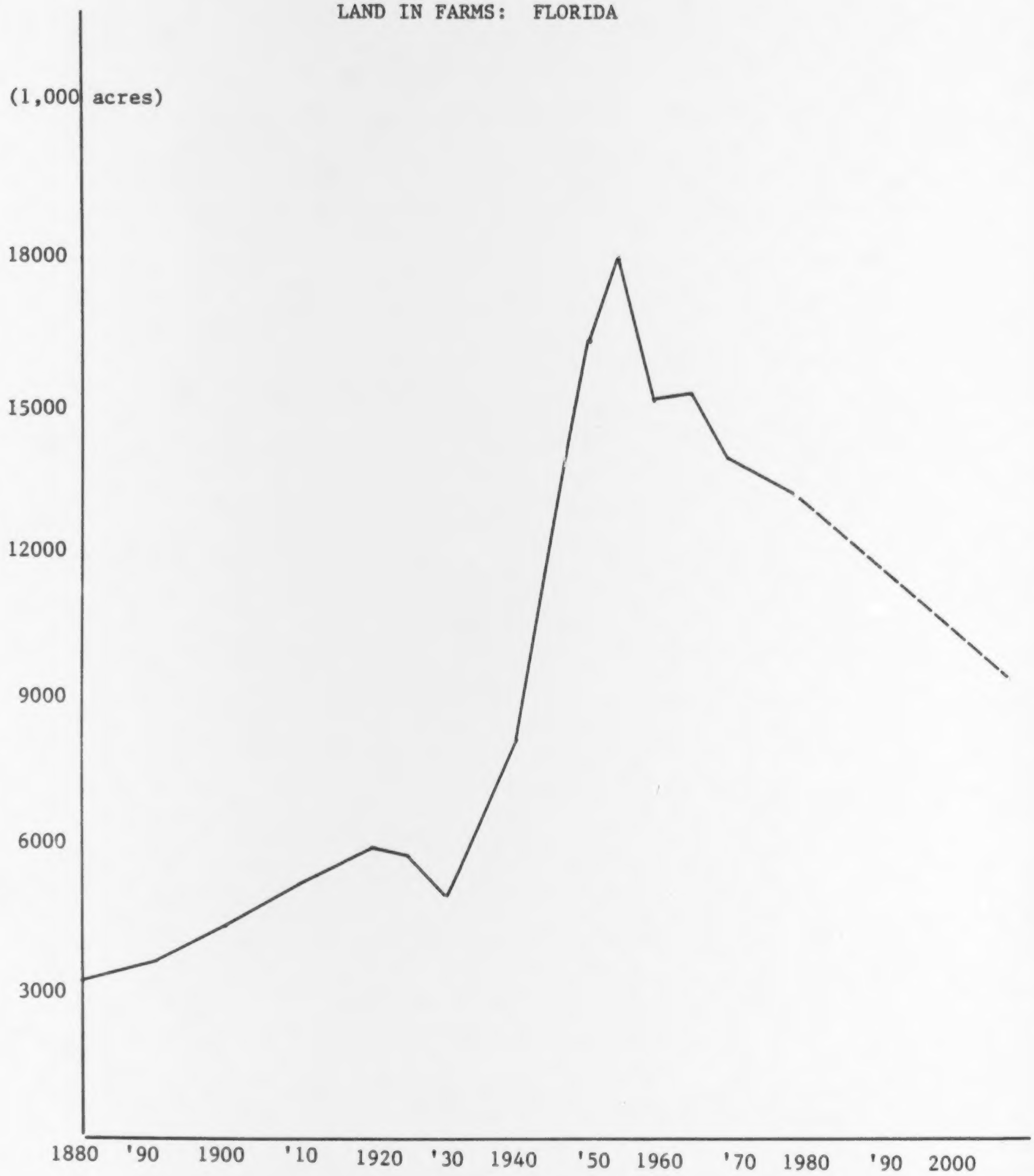
Florida's agriculture is often considered an economic shock absorber relative to the other economic sectors of tourism and construction. Maintaining this stabilizing nature of Florida's agriculture makes it even more vital to adopt new production and distribution methods. The greater the dependence on current sources of energy inputs, the higher the risk of disruption to our food supplies.

Nationally, processing, packaging, and transporting food uses 60 percent more energy than all the farms that produce our food.[14] Florida imports virtually all of its processed foods and spends over $40 million a year to ship its unfinished calves to Western grain fields and to transport back steaks and hamburgers.[15] Dependence on long-distance food transport makes supplies tenuous in many areas.

Florida's food system, like others, is vulnerable. An energy cutback, a transportation strike, a freeze, drought, or labor dispute could mean a food crisis. Our method of producing food is wearing away our state's productive capabilities. In earlier times, a food system that consumed resources so heavily seemed to make sense. In today's world, it does not.

But the situation is far from hopeless. Florida has the resources, both in land and people to change this dangerous position. We can preserve our farms and farmland, increase our self-reliance, and develop a secure food supply, if we act now. The purpose of this report is to help us begin to do that.

LAND IN FARMS: FLORIDA



Source: U.S. Department of Commerce, Bureau of the Census, Historical Statistics of the United States Colonial Times to 1970 (Washington, D.C.: GPO, 1975), pp. 458,459; U.S. Department of Agriculture, Agricultural Statistics 1981 (Washington, D.C.: GPO, 1982), p. 416.

The Frightening Facts

It's all too easy to get a false sense of security about Florida's food supply with a glance at the statistics. After all, Florida ranks eleventh nationally in agricultural sales and first in the Southeast. The state's agriculture nets some $3.8 billion in cash receipts and generates a $12 billion agribusiness economy that employs an impressive 22 percent of all civilians in Florida.[16]

The list of honors is a lengthy one. The Sunshine State leads the nation in orange, grapefruit, sugarcane, lime, and mango production and ranks second in tomato and honey production.[17] Florida also rates as one of the top ten U.S. producers of peanuts, potatoes, eggs, fish, and lettuce and is the ninth leading state in beef numbers.[18] Citrus sales, livestock and products, and vegetables and melons accounted for a third, a quarter, and a fifth, respectively, of 1980 cash receipts.[19]

Despite these agricultural success stories, 65 percent of the food Floridians consume is imported from states as far away as Oregon.[20] Florida residents spent over $9 billion for food in 1980--$971 for every child, woman and man in the state. Of this amount, $6 billion was paid for food produced outside Florida. About $10.8 million leaves the state each day to pay for our imported foodstuffs.[21]

Florida may find itself importing even more food if the population keeps rising while acres of available farmland keep dwindling. Florida's booming population, which is 80 percent urban, grows 3 percent each year, the fourth highest rate in the nation.[22] Yet from 1966-1977, Florida experienced the greatest loss of farmland in the U.S., totaling 3.47 million acres, an area 2½ times the size of Dade County.[23]

Dade County, alone, has lost over 35,000 acres of agriculture land in the past 15 years. Roughly 70,000 acres of farms and groves producing 52 commercial winter crops are at stake--crops grown nowhere else in the country. Present rates of farmland loss could mean the end of this essential production by the year 2000.[24]

Current efforts are underway by Dade County in an Agricultural Land Use Planning Project. Through land use controls, planners hope to stop the urban cannibalism like that in Broward County, where development has forced farmers off all but 5.9 percent of the county's land since 1950.[25] Neighboring counties face the same dilemma--people versus crops.

As urban development swallows up South Florida's farmland, land values continue to escalate. Over the past decade, Florida agricultural real estate has shown a threefold increase from $5.2 billion to $15.1 billion.[26] In Palm Beach County, an acre that once grew beans now sells for as high as $50,000.[27]

As a result, speculators own a great deal of the land planted in fruits and vegetables, and they wait like hawks for the opportune time to sell out to developers. For instance, in 1979, approximately 95 percent of the South County agricultural area was leased to farmers. Many of these farmers work on a crop-to-crop basis and have little say over the future of their $60,000,000 plus winter vegetable industry.[28] Statewide, roughly a quarter of the farms are leased or rented.[29]

Northern Florida also suffers from loss of farmland. Most of the prime farmland, which is the best land for farming, is located in the northern and western areas of the state. But between 1958 and 1977, Florida lost 37 percent of its prime farmland to nonagricultural use--some 639,000 acres.[30]

Over half of the 44,068 farms in Florida work only 3 percent of the state's farmland. A mere 8.6 percent of the farms (those over 500 acres) control over three-fourths of the farmland.[31] This skewed distribution of power over the bulk of Florida's farmland means that fewer hands control the direction of Florida's food system. A system dependent on large farms is less flexible or adaptable in times of stress than one composed of many small farms. A recent USDA study concludes that consumers benefit little in terms of lower real food costs from further increases in farm size over the medium-sized farm that grosses from $41,000-$76,000. Roughly 14 percent of the farms in Florida gross over $76,000. The same study also claims that a 143 acre farm in the Southeast can be 90 percent as efficient in terms of production costs as a 399 acre farm.[32]

Unlike land lost to parking lots and buildings, land lost through soil erosion often goes unnoticed, especially in the nearly level areas of Florida. Florida's annual soil losses average between 2 and 5 tons per acre, amounts that fall within the range of annual soil loss tolerance limits for most soils.[33]

But averages can be misleading. Of Florida's total cropland, 21.5 percent of the acres erodes at a rate greater than 5 tons per acre a year, and over 100,000 acres exceed 14 tons per acre.[34] The amount of soil eroded from cropland, pastureland, rangeland, and forestland totaled more than 14 million tons in 1977[35]—enough to cover the city of Fort Lauderdale with 5½ inches of soil every year.[36]

Each acre-foot of this eroded topsoil can store about two inches of available water for crops, and contains 8,000 pounds of phosphorus.[37] So through erosion, Florida loses about 69.3 million pounds of nitrogen and 17.3 million pounds of phosphorus.[38] These figures represent 8 percent of the nitrogen and 10 percent of the phosphate used in fertilizers over one year in the state—an annual loss equivalent to over $11 million in fertilizer materials.[39] And this does not include the 470 million gallons of water storage capacity lost or the long-term decrease in the productivity of the soil.

Loss of fertilizer value is especially crucial because Florida's infertile, porous soil requires seven times more fertilizer than the national average.[40] With such a high fertilizer demand, future supplies of nitrogen, phosphorus, and potassium sources will have a profound impact on Florida's agricultural productivity.

One of the richest phosphate deposits in the world is the Bone Valley formation in central Florida, which accounts for 75 percent of total U.S. production of phosphate.[41] Future demand for phosphate rock is expected to be similar to today's market. Production, however, is expected to peak in 1990, at 60.8 million metric tons, and decline thereafter. Consequently, the supply of phosphate rock is projected to be adequate to meet demand only until 1992.[42]

Worldwide, fertilizer consumption has increased five times since the 1940's.[43] In Florida alone, 1980 consumption of fertilizer mixtures and direct application materials totaled over two million tons of nitrogen, phosphorus, and potash.[44] Such energy-intensive systems of crop production face serious problems as the nonrenewable resources of petroleum, phosphate and potash become rapidly depleted.

Future supplies of petroleum will also affect the transportation of agricultural produce. In 1979, Florida fruit and vegetable producing areas shipped over 6.8 billion pounds of fruits and vegetables to domestic markets, accounting for 17.3 percent of total U.S. fresh fruit and vegetable shipments.[45]

Trucking accounted for 98.7 percent of this "perishables" traffic, compared to 66.7 percent in 1960. Rail shipments accounted for a mere 1 percent of the traffic in 1979 versus 30 percent in 1960. Within two decades, dependence on trucks had increased by a third. Yet compared to trucking, rail transportation is the more efficient mode in fuel per ton-mile.[46]

Refrigerated trucks are another expense in transporting agricultural perishables. These trailers are expensive, especially to independent owner-operators. There is little incentive for empty refrigerated trailers to pick up a northbound load of fruits and vegetables from southern production areas.[47] In addition, vegetables are mostly harvested at the same time that other produce transportation demands are high throughout the country. Thus, competition for markets and trailers plus the seasonality of Florida's shipments increase the likelihood of a trailer shortage. Three years ago, for example, a trucker strike caused nearly one-fourth of the melon acreage to go unharvested.[48]

In 1980, Florida became the first state to deregulate motor carriers. One report claims that deregulation has left fewer firms to transport Florida's perishables. In essence, previously exempt commodity haulers can now transport regulated products. During peak shipping seasons, the remaining trucking firms have in the past threatened a slowdown or strike because of operating expense.[49] There may be ample truck ownership today, but as changes like deregulation and fuel cost increases come about, the need for alternative transportation modes grows more acute.

Economically, Florida relies heavily on the export of citrus and vegetable products. Oranges account for 71 percent of total citrus sales, and tomatoes make up 31 percent of total vegetable and melon sales.[50] Close to 100 percent of Florida's fruits and vegetables are consumed fresh, with 85 percent of the oranges and 90 percent of the tomatoes shipped out of state.[51] Economic and natural events, however, can act to sever this dependence on exports.

Foreign competition is one element that can weaken Florida's food economy. In 1978, south Florida tomato farmers filed federal produce dumping charges against Mexico. They claimed that, since 1964, Mexicans had been selling tomatoes at illegally low prices during peak Florida production periods. The Mexican growers could afford to underprice Florida growers through a 30 percent cut in production costs with the use of less expensive pesticides that have been banned in the United States. Prices were depressed so severely in 1979 that two major south Florida grocery chains bought Mexican tomatoes in Nogales, Arizona and trucked them to Florida instead of buying Florida grown tomatoes.[52] Currently, the battle rests in court.

Foreign imports have had a less heated effect on the orange juice industry. Americans drink more orange juice than the United States produces and Brazil fills the gap. In 1981, Brazil shipped a record 56 million gallons of orange juice to the U.S., the bulk of which entered Florida supply channels.[53]

Depending on how it is viewed, importing from Brazil is either good or bad news. Economically, imports can make sense. According to one economist, Florida growers could make more money without orange juice imports from Brazil, but without imports, the market would be more volatile. Imports help to stabilize prices in times of natural disasters that hurt orange crops.[54]

For instance, the killing frost that hit Florida's orange-growing areas on January 11 and 12, 1982 may push Brazil imports into the U.S. up to 75-100 million gallons, a 25-50 percent increase over last year.[55] Therefore, Brazil can act as an effective supply source and help keep down retail prices that would otherwise be higher.

On the other hand, imports could severly hurt the Florida grower. As more land is lost to development, imports from Brazil could take a dangerously large share of the citrus market. Development pressures are largely responsible for the 110,000 acre decrease in southern Florida citrus areas since 1970.[56] Imports can help stabilize the market, but when the world economy is highly unstable, dependence on imports can lead to unstable prices in the United States.

The freeze in January, 1982 created a heavy loss of Florida grown oranges. Approximately 28 percent of the orange juice concentrate yield has been estimated as lost to the freeze, an equivalent of 51 million gallons.[57] Only a year ago, a two-day freeze cut production of orange juice concentrate by 65 million gallons.[58] And in 1977, three nights of subfreezing temperatures virtually destroyed the winter vegetable crop, 65 percent of the midseason oranges, and more than a third of the grapefruit crop.[59] It doesn't take much. Four hours of a 28°F temperature and citrus fruit gets beat by the cold.[60]

A recent and growing problem of alarm to Florida farmers and residents is the acidity of Florida rainfall. Acid rain has increased over the past 25 years to pH levels on par with that of lemon juice or vinegar.[61]

Acid rain is usually associated with northern coal producing areas. High rainfall and the low buffering capacity of northern Florida soils, along with increased population and shifts to coal as an energy source have combined to intensify acidic rain in the south.

Crops and fisheries may feel acid rain's impact most. The acid can cause holes in lettuce, spots on tomatoes, and retardation of plant growth. In addition, nutrients are leached from the soil that will require even more fertilizer to replace lost nutrients. Fish may fail to reproduce and can be killed, as has happened in the Adirondack Mountains of New York, where more than 300 lakes are estimated to be sterile.[62]

Rainfall averages over 50 inches a year in Florida, making the Sunshine State one of the wettest in the nation. With development, however, came 1,400 miles of canals and waterways that drained what was once a sponge of swamps, marshes, and flood land to agricultural fields and urban developments. In southern Florida, drainage has lowered water tables as much as 6 feet below levels recorded in 1900.[63] As a result, surface water quality has been threatened and water flow into underlying reservoirs, or aquifers, has been restricted.

Florida is unique among other states, since 92 percent of the population and 70 percent of the agricultural requirements depend upon groundwater for their water needs.[64] The Floridan Aquifer, one of the world's most productive underground water supplies, is estimated to hold more water than all five of the Great Lakes combined.

Still, Florida faces water shortages. The problem is that only a fraction of the Floridan Aquifer water can be withdrawn. Water that is up to three times saltier than ocean water underlies all of Florida, and salt water intrusion is inevitable and irreversible if the level of fresh water is drawn below sea level.[65]

For replenishment, the Floridan Aquifer relies on rain which falls primarily from June to mid-October. Only 10 percent of this seasonal rainfall ultimately filters through to the underground reservoir.[66] Furthermore, for the past eight years, rainfall has been below normal, and over the past 20 years, Florida has experienced a 75 inch rain deficit.[67]

Whether the state is in early stages of desertification or under a drought cycle is a question on the minds of concerned Florida residents. One point made is the fact that three-fourths of the land areas around the world at Florida's latitude are dry, desert areas.[68] Currently, 19 percent of the earth's land is threatened by desertification, and each year, the world loses an area the size of Maine to this drying-up process. At this rate, we could lose one-third of the planet's arable land by the year 2000.[69] In Florida, deforesting and paving over the land may contribute to the desertification process.

Both agricultural and urban users heavily tax Florida's water supplies. Between 1950 and 1977, Florida's water consumption rose five times the increase in population over the same period.[70] In densely populated regions of southern Florida, water levels in canals are kept low enough to prevent flooding, yet this means that millions of gallons of water are flushed out to sea and wasted, rather than allowed to filter through to aquifers.

Agriculture is also guilty of wasting Florida's water. The agricultural industry uses between 40 and 60 percent of the state's water[71] as it irrigates 50 percent of its cropland and 42 percent of its pastureland.[72] Indeed, Florida uses twice as much water for irrigation than all other states east of the Mississippi River combined.[73] Its irrigated land produces over 80 percent of the value of crops produced.[74]

A 1976 national study estimates that at least half of irrigation water is wasted either in inefficient techniques or in low-value crops. In Florida, over 2 million acres use surface, or open-ditch, irrigation systems. This system delivers water quickly, easily, and inexpensively, but only 50-60 percent of the applied water actually reaches the plant for use. In Florida, nearly 900,000 acres utilize sprinkler systems, which get 10-25 percent more water to the plants compared to surface irrigation techniques.[75]

Attempts are currently underway to improve irrigation management of the fertile but decaying 750,000 acres of muckland around Lake Okeechobee, where sugarcane and vegetables are important crops. The muck is gradually oxidizing and shrinking as a result of 50 years of drainage that has robbed the soil of water and exposed it to air and sunlight. Since 1924, almost five feet of "subsidence," or shrinking has occurred. Researchers predict that large tracts of the muckland could become unsuitable for vegetable or sugarcane production by the year 2000 if current agricultural practices don't change.[76]

In east and central Florida, groundwater levels dropped as much as 11 feet below normal during a record breaking 1981 drought that caused the following:[77]

* Lake Okeechobee's water level fell 7 feet below normal, too low to recharge the surficial Biscayne Aquifer, a crucial water source for the fruit and vegetable counties of Dade, Broward, and South Palm Beach.

* Massive fish kills occurred in Lake Apopka and St. Johns River.

* In Winter Park, a sinkhole 400 feet wide and 75 feet deep swallowed a house, half a city swimming pool, telephone poles, and cars because the water table had dropped too low to support an underground limestone cavern.

* Saltwater intruded into some drinking water wells and mandatory limits on water use were imposed by three water management districts.

Five water management districts were set up in Florida under a Water Resources Act of 1972. Whether these districts will have a significant impact on the future of Florida's water supply is unclear. Water-use permits are now required by anyone who wishes to use Florida water for other than domestic purposes. Yet in its seven years under the consumption use permit system, the South Florida Water Management District has never denied a permit application.[78] Strong political and economical forces also interfered with proper water conservation policies.

One of Florida's attributes to its food supply is the fishing industry. In 1979, the state's commercial fisheries landed over 167 million pounds of fresh and saltwater fish from the Gulf of Mexico and the South Atlantic Ocean. Compared to other states, Florida ranks tenth in tonnage of fish landed and sixth in fish value.[79]

Valuable shellfish account for about 68 percent of Florida's total value of landings. However, heavy reliance on exporting high-value fish such as shrimp and lobster, could possibly spell financial problems. Over the past 20 years, high profits have led to a 76 percent increase in shrimping boats and vessels. But as income for nonessential food products drops, so does demand, and the industry suffers through lower prices. Soaring fuel costs and increased competition with foreign imports only act to undermine the soundness of commercial fisheries.[80]

Environmental concerns also play their part in undercutting fish productivity. Along Florida's 11,000 mile coastline lie estuaries, areas in which an arm of the sea meets the mouth of a river. Roughly 85 percent of the commercial fish and shellfish in Florida are estuarine-dependent during their juvenile or breeding stage.[81] Freshwater flowing from a river into an estuary helps to dilute and push the saline water out to sea. This freshwater flow increases the protection against predators and enhances a productive food chain. But dredge and fill projects, land reclamation, flood control, mosquito control structure, dams, and canals impede this essential flow of freshwater.[82] Also threatening fish survival is the ingestion of pesticides, heavy metals, industrial contaminants, and petrochemicals that find their way into the estuaries.

Fish are not the only species blindly affected by the unjudicious use of pesticides and insecticides. So, too, is man. In one year, agricultural products are estimated to have used 30.3 million pounds of pesticide ingredients. Citrus production alone accounts for 41 percent of agricultural pesticides use.[83]

Studies show, however, that the place of pesticides in future crop productivity will probably be weakened for reasons of health, expense and ineffectiveness.

- Currently, more than 364 species of insect pests have developed resistance to pesticides--breeding what experts call "superpests."[84]
- Levels of DDT and its metabolite, DDE, are nearly twice as high in residents of a warmer state like Florida compared to people in northern states.[85]
- In 1980, the Environmental Protection Agency confirmed 102 pesticide poisonings and 4 deaths caused by pesticides in the south Florida area.[86]
- Of 132 college male students tested, 23 percent had sperm counts of 20 million or less per milliliter of semen, the equivalent of being sterile. Such evidence has been associated with the introduction of chemical pesticides during the 1940's and 1950's, the same time that male fertility began to drop.[87]
- Pesticides have also been suspected as a cause for rates of birth defects that are twice as high in agricultural areas of Dade County as nearby urban areas.[88]
- Blood tests of some Dade County pest exterminators show greatly reduced levels of the important enzyme, cholinterase,that regulates chemical transmission of nerve impulses.[89]

In addition, migrant workers who help raise and harvest winter fruits and vegetables in South Florida are plagued with substandard, poorly ventilated housing. The unsanitary migrant camps favor roach and fly infestations that increase the use of domestic pesticides use.[90] Therefore, these workers are exposed to both pesticide residues on crops as well as in their homes. Homeowner pest control in all of Florida involved 2.3 million pounds of pesticides.[90a]

What Do These Facts Mean?

These disturbing facts and figures can be summed up in a few words--Florida's food system is vulnerable. Our supplies of meats, grains, processed vegetables, and various dairy products depend on outside producers. An oil embargo, energy shortage, labor dispute, or crop failure--alone or in combination--could lead to shortages of these supplies, as well as severely impair Florida's own production systems.

Trends point to an uncertain food-secure future. Demand for food rises as Florida's population creeps near the 10 million mark. Farmland gives way to streets and buildings. As a result of development, higher fuel and production costs, and unresponsive market prices, farmers may switch to crops that require less energy and less land while proving more profitable to grow. For instance, in 1978, there were 173 percent more commercial nurseries and greenhouses (with sales over $2,500) than in 1969. During the same time span, fruit, nut and berry farm numbers increased by only 4 percent and vegetable farms by 37 percent.[91]

Furthermore, our economy is weakened. Florida ships 65 percent of the food it produces out of state. While these export sales serve to channel outside dollars into the state and trigger chain reactions of economic activity, they also can weaken the food system if too highly depended upon. A decrease in export sales will trigger a chain of decreased economic activity within Florida. And as transportation costs rise, other states that now rely on Florida's fruits and vegetables may begin to produce more of their own tomatoes, sweet corn, and peppers.

What Can We Do?

The situation is far from hopeless. Florida's food system has the capability to be less vulnerable, without taking away from its valuable vegetable and citrus production.

Currently, over 13 million acres of land are in agricultural use, including 4.5 million acres of cropland and 8.4 million acres of pasture and rangeland. Florida's total cropland base of 6.8 million acres includes both current and potential cropland, enough to produce all the food that the state's residents consume, except beef. Beef production alone would require another 4.6 million acres. With our present diet and production systems, we would need around 11.4 million acres of cropland to be totally self-sufficient, nearly 7 million acres over current cropland acreage.[92]

Besides not having enough cropland to be self-sufficient, Florida's soil and climate cannot support crops like asparagus, cherries, and coffee, nor are they conducive to certain high crop grain yields without the heavy use of fertilizers and pesticides. Total self-sufficiency, however, is not necessarily the desirable goal. A more realistic and feasible goal is increased self-reliance in the foods we eat to reduce food costs, raise nutritional quality, strengthen our economy, and decrease the vulnerability of our food supply.

Florida now exports over 70 percent of the fresh vegetables produced in the state. At the same time, virtually all of its frozen and canned vegetables are imported. Too great a reliance on exports can be a weak link in the food chain. By processing our own vegetables, we would spend a larger portion of our food dollars at home, dollars that would otherwise be lost by importing food products from other states and countries.

For instance, Florida exports nearly 90 percent of its tomatoes in the fresh market. Yet over 600 million pounds of tomatoes were shipped into Florida in 1980 in the form of catsup, paste, juice and canned tomatoes. If Florida would process these products in state, it could still export over 200 million pounds of its tomatoes.[93]

We also import 80 percent of our grain food products. Although sugarcane and soybeans are Florida's two leading field crops, the state still must import 38 percent of its sugar and 100 percent of its soy-based foods.[94] Again, increasing in-state processing would fuel local economies while increasing our self-reliance.

Another area in which Florida can become more self-sustaining is in the production of meat. We now import 85 percent of our beef, 97 percent of our pork, and virtually 100 percent of our lamb and mutton. Florida ships roughly 78 percent of its feeder calves to cattle feeding areas in the Southwestern and Plains states, a distance of 1,400-2,200 miles. Trucking calves out-of-state and beef back into Florida for in-state consumption has been estimated to cost $42.9 million a year, an amount equal to 12 percent of the 1980 cash marketings of Florida cattle and calves.[95]

Florida has both the land resources and slaughter capacity to raise more cattle, thereby decreasing transportation costs and boosting the state's economy. Even with cattle in-shipments, Florida's slaughtering plants operate at only 71 percent of capacity. More Florida-fed cattle could fill the meat packers' quotas as well as meet consumer demands.[96]

The 4.6 million acre land requirement for beef previously mentioned was derived using a high-grain cattle feed, which is what Florida feed-lots use to fatten their cattle--rations that are comprised of 73 percent corn grain. But for a state like Florida, a high-concentrate cattle ration is not a sustainable method. Roughly 74 percent of the corn fed to Florida cattle is imported from Georgia and the corn belt.[97]

Northern Florida has shown its potential for higher corn production, when in 1976, the corn producing counties in Florida harvested 28.8 million bushels. On dry, sandy soils where corn yields are low, grain sorghum could be developed for late season production.

With improved technology, a more resourceful supply of cattle feeds could be found in the many by-products of agricultural industries. Tons of dried citrus pulp, citrus molasses, and blackstrap molasses are produced annually. Sources of fiber could include bagasse from sugarcane, peanut hulls, poultry waste, rice bran, soybean hulls, and distillers' by-products. And with Florida's vast forest and fish resources, paper and wood wastes and fish by-products hold great potential as cattle feeds.

Grass-fed cattle will share a bigger part of the cattle industry as more consumers prefer leaner meat over the marbled (fat-streaked) meat that results from grain-fed cattle. Much of the 12 million acres used for cattle in Florida is unimproved range and woodland pasture that can produce only 40 pounds of beef per acre. But a cow-calf crop at the University of Florida is producing 400 pounds of beef per acre on improved pasture. If all 12 million acres of pasture were improved and properly managed, Florida could increase its beef production ten times.[98]

We could also stregthen our food system by increasing local fertilizer consumption. Each year, the livestock, poultry and humans in Florida produce 16 percent of the nitrogen, 25 percent of the phosphorus, and 16 percent of the potassium presently used by Florida agriculture.[99]

Current use of manures and domestic wastes rather than chemical fertilizers do involve higher labor and application costs; however, biological farming may grow more favorable as fertilizer costs rise and supplies falter. In China, for example, methane (biogas) generation from agricultural bioproducts and animal wastes is extensive with 7 million generators now in use.

To help ease Florida's water problems, both urban consumers and farmers can tighten their belts. In Key West, where desalination increases water expenses, a person typically uses 90 gallons of water per day. (The national average is 200 gal/day/person.) And during the 1981 drought, farmers to the south of Lake Okeechobee got by on less than 15 percent of their normal water allotment.[100] America's water consumption habits don't always reflect true need.

A family of four typically uses 225 gallons of water each day, nearly half of which is toilet water. Everytime a toilet is flushed, five to six gallons of fresh, drinkable water are flushed away. By implementing low pressure toilets, 50 gallons of water could be saved per day. A ten-minute shower uses 50 gallons of fresh water, which can be cut in half by installing an inexpensive flow reducer.[101]

Far more inventive is the composting toilet, which uses no water at all. A composting toilet converts household food and human wastes to humus by composting wastes by microorganisms. This nutrient-rich humus can then be spread as a plant fertilizer. A similar idea is the Graywater System that filters and reuses water from the shower, bath, lavatory, kitchen sink, and washing machine.[102]

Even though farmers use raw, unprocessed water, they can still implement water-saving techniques to prolong the productive life of their soil. Instead of using the predominant surface irrigation systems, growers could install drip irrigation systems that are 90-95 percent efficient in delivering water directly to the roots of plants.[103] More growers could also install sprinkler systems, which use one-sixth of the water of surface systems.[104]

Our farmland can benefit from better utilization of local food resources. An unconventional crop like rice is showing great potential for a permanent spot in the agricultural area of the Everglades. In 1977, rice was harvested for grain for the first time since the 1950's, when fear of a virus disease halted production. By introducing rice, the flooding acts to slow down the current oxidation that robs 10-12 inches of organic soils each decade.

Currently, about 300,000 acres of Everglades land are planted in sugarcane, of which 85,000 acres lie fallow for 8 to 10 months each year. In addition, 50,000 acres devoted to different vegetables lie idle in the summer months. If this total 135,000 acres of sugarcane and vegetable land incorporated rice production, the area could produce 710 million pounds of rice each year, which is enough to satisfy the milled rice consumption of over 50 million people.

Other aquatic and semi-aquatic crops could also extend the productivity of the Everglades. There is a demand and ready market for certain Asiatic and tropical American vegetables suited for the wetlands. Watercress, water spinach, oriental waterchestnut, swamp fern and taro are some aquatics that show potential for Everglade agricultural production.[105]

Diversifying production is a key element in becoming more self-reliant. Diversification, however, will only come about if farmers can be assured of a ready market. Since diversifying would mean small, scattered acreages of different crops, direct marketing from the farmer to the consumer is the best marketing alternative. In 1978, nearly 3,000 farms in Florida grossed over $12 million in direct sales to consumers. With Florida's year-round growing season, more direct markets would serve well.

Roughly 95 percent of the blueberries produced in Florida are directly marketed through Pick-Your-Own (PYO) operations. An analysis of blueberry PYO's in Florida illustrates both producer and consumer benefits:[106]

- Growers required smaller capital requirements because of the elimination of picking, packing and transportation expenses.
- PYO outlets gave farmers greater price control and assurance of a ready market.
- Compared with prevailing prices at area supermarkets, customers saved an average of $5.94 per transaction.
- Customers rated the freshness and overall quality of the PYO blueberries higher than that of blueberries usually found at retail grocery stores.

Generally, PYO outlets offer consumers an opportunity to obtain fresh, high quality produce at reasonable prices, while increasing financial returns to farmers.

Expanding the role of home gardens is yet another approach to increasing food stability. Approximately 42 percent of the households in Florida have vegetable gardens. These gardens produce nearly 40 percent of the vegetables we now eat (the average U.S. garden in 1979 produced 545 pounds of vegetables). If each of these 1.57 million gardens produced 883 pounds of vegetables, all of Florida's fresh vegetable needs could be provided.[107] Should a bulk of Florida's commercial vegetable production switch to other crops or be pushed out of business by development pressures, these figures show the significant contribution home gardens can make to a state's food supply, self-reliance, and economy. Furthermore, home canning and freezing would decrease the dependence on processed foods that are now shipped into Florida. Even urban gardens can make a significant contribution to the food supply, whether they are in community lots, patio containers, windowboxes, rooftops or backyards. The Florida Community Gardening Pilot Program of 1980 provides permits for residents of specified counties to use vacant public land for gardening. Such a program is a step in the right direction.

Recommendations--The State

A. PRESERVATION OF FARMLAND

1. The Greenbelt Law now provides for tax assessment of farmland on the basis of agricultural value rather than market value. Revisions are needed, however, to recapture taxes on land that is held for investment rather than for agricultural production.
2. Institute a Capital Gains Tax like that in Vermont, where short term owners of agricultural land must pay up to 60 percent of the difference between the original payment and the selling price of the land.
3. Combine land use provisions with tax relief. For instance, the Farmland Preservation Act of 1977 in Wisconsin grants contracts to farmers to keep their land in agricultural use for five years in exchange for income tax credits. With the state's "Circuit breaker" tax, a farmer's total tax load is reduced when property taxes exceed a certain percentage of his total income.
4. Designate Class I and II lands be used for agricultural use only.

5. Implement a heavy tax on profits made on the development of former agricultural land.

6. Continue to enforce the state's Right to Farm Law.

7. Develop a procedure that allows the state "first refusal" rights to agricultural land being sold. In France, farmland owners who have intentions of selling their land must notify a non-profit corporation, that has the right to buy the land and sell it to another farmer.

8. Employ agricultural zoning, but in a way that does not promote low density residential areas. In Pennsylvania, Maryland, and California some local governments enforce Exclusive Farm Use Zoning which requires that large minimum lots of 20 to 30 acres be used only for farm related operations.

9. Expand the State Comprehensive Planning Act of 1972 to implement legislation against leapfrog development.

10. Establish agricultural districts to protect farmland from urban expansion.

B. REGIONALIZE FOOD SUPPLY

1. Provide tax incentives for small scale food producers--such as not taxing the first $10,000 of income from food produced for local production.

2. Set up various support programs to promote a diversified agriculture.

3. Develop incentives to enter farming, such as state loans with deferred or reduced payment until five years after start-up. States could also provide technical, managerial, and organizational assistance for new farmers.

4. Establish demonstration experiments to test crop, animal, and fish varieties suited to the state's soil and climate, and develop and test low input, sustainable farming techniques suitable to the state.

5. Mandate a study by the State Department of Agriculture and the state land grant university of the potential for producing the various crops needed in the state.

6. Issue state tax credits for home production, processing, and storing of food.

C. EXPAND LOCAL MARKETS

1. Give preference to in-state producers in bidding for the sale of foods to state-run institutions.
2. Provide incentives for farmers to operate roadside stands and "pick-your-own" operations.
3. Develop an extensive program promoting and advertising state-grown products for in-state consumption.
4. Establish more farmers markets, especially in urban areas, and set up wholesale farmers markets to supply retailers, co-ops and other volume purchasers.
5. Encourage the development of more processing plants and provide assistance to these plants that purchase local products.
6. Provide assistance to small growers through a statewide marketing clearinghouse.

D. STOP EROSION

1. Establish penalties for erosion damage such as prohibiting all agricultural production activities which result in more than five tons of soil loss per acre per year--the maximum rate at which the soil's fertility can be maintained.
2. Establish rewards for soil enrichment, such as tax credits for on-farm soil and water conservation programs.
3. Provide additional state funds for the completion of the statewide soil survey.
4. Monitor the success of Florida's non-regulatory Agricultural 208 program, which encourages farmers to prepare and submit a conservation plan that includes"best management practices." The program also provides an educational program for agricultural landowners through the Cooperative Extension Service. Consideration should be given to making conservation plans mandatory.
5. Institute and enforce a "severance tax" on soil losses due to excessive erosion. Tax revenues from farms permitting rapid erosion could be used to finance subsidies to encourage conservation practices, and to pay for downstream dredging of silt, damage to water treatment facilities and other social costs.

6. Develop tax incentives for soil conserving measures, such as investing in no-tillage equipment. According to the USDA, practicing just minimum tillage techinques on 80 percent of all U.S. cropland would reduce soil erosion by 50 percent or more.

7. Link economic programs--such as loans, crop insurance, disaster relief, and state purchase of farm commodities--to avoidance of excessive soil erosion.

8. Develop incentives for encouraging the use of rental arrangements, which include provisions for sharing erosion control and soil enrichment costs with landowners.

9. Offer "conservation achievement contracts" whereby farmers would be provided with annual payments determined by the amount of reduced erosion achieved.

10. Use public subsidies, such as low interest loans, preferential farm property tax evaluations and other tax incentives to encourage regional organic waste recycling, cover and permanent cropping, minimum tillage, proper rotation, biological nitrogen fixation, contour plowing, terracing, stripcropping, leaving harvest residues on soil surfaces, reducing soil compaction and salinity, and intercropping.

E. DEVELOP ON-FARM RENEWABLE ENERGY SOURCES

To switch the energy base of the U.S. food system from nonrenewable to renewable energy will be expensive, but to continue to run the food system almost entirely on fossil fuels as we are now doing will be even more expensive. For example, to produce the amount of energy currently consumed by the U.S. food system with present solar energy technology would cost about $500 billion. But once the system was switched over to renewable energy, the annual costs for fuel would be greatly reduced, and the annual costs for imported oil (a major driving force behind inflation) would be eliminated.

Florida can help with this transition from depletable to renewable energy sources with various approaches:

1. Conduct regional inventories of all renewable energy sources.
2. Provide incentives, such as tax credits for investments made in agricultural energy conservation and on-site development of renewable energy sources; or low-interest loans for accomplishing the same; or tax exemptions for income received from the production of renewable energy.
3. Set up pilot projects and demonstration sites using alternative forms of energy for various types of farms, and showing recycling and the use of sludge.

The Land Grant College

In 1978, the University of Florida developed a low energy technology (LET) research program.[108] This program recognized Florida's dependence on cheap energy and the necessity to increase energy efficiency in production, transportation, harvesting, processing, and marketing. Directly, the researchers hope to develop alternate, less energy-consuming methods for 1) on-farm transportation, 2) pumping water, 3) harvesting, processing, and marketing, and 4) applying fertilizers and pesticides.

Indirect approaches to reduce energy consumption include 1) plant and animal genetic selections that are more efficient in converting nutrients into biomass, 2) more widespread use of resistance and biological controls, and 3) conversion of agricultural wastes to energy sources such as methane.

The following accomplishments of the University's Extension Program are worth noting for their contribution to reducing energy farm use:

a. Completed multiple cropping and minimum tillage demonstrations in at least six counties.

b. Developed forage management programs that included use of legumes to replace nitrogen fertilizer.

c. Developed a Farm System Laboratory that provides producers, policy makers, and agricultural experts a computerized source of input-output data for all of the major commodities in the state. The lab also estimates total energy requirements of Florida's agriculture under alternative energy systems.

d. Tested alternatives to petroleum energy including a wood burning truck (wood gasification) that has run 7,000 miles, a methane collector using swine waste, and a solar grain drying unit supplemented with propane gas.

e. Established a Center for Bio-Mass Energy. Estimates indicate that marine water lying off the coasts of Florida have the potential for abundant biomass production.

F. CONSERVE WATER

1. Price water to accurately reflect its actual cost and need.

2. Provide investment incentives for drip irrigation and other water conservation equipment.

3. Provide tax credits for those who install water-saving devices in their homes.

G. RECYCLE ORGANIC WASTES

1. Prepare a state-wide inventory of the types and amounts of organic wastes available now and in the future and assess the ability of these wastes to improve soil fertility and tilth.

2. Establish an Agricultural Waste Council in the State Department of Agriculture to develop desirable legislation and other measures to facilitate recycling of wastes.

3. Develop incentives for using local organic wastes for fertilizer and incentives to industry to separate toxic substances from their wastes so that it might be more safely used on cropland.

H. DEVELOP IN-STATE FOOD PROCESSING

1. Provide incentives to attract food processors that can meet the needs of producers and consumers and enhance the local economy.

2. Provide incentives for on-farm processing, cooling, and fresh packing of local food crops.

3. Help establish community food processing and storage facilities for the use of families and small community food producers. In this way, economies in equipment and energy consumption can be realized.

I. DEVELOP LONG-RANGE FOOD SYSTEM PLANS

1. Develop an overall state food policy which will increase regional self-reliance and economic viability while decreasing the vulnerability of the state's food supply.

2. Develop an emergency food plan to deal with a food supply disruption. This might provide for regional grain storage facilities and the formation of state-wide communication and coordination centers.

3. Conduct an annual study of the condition of the state food system that will illustrate the amount of food currently being imported and exported, the amount of land lost to development, soil erosion losses, and what measures need to be taken to increase the state's self-reliance.

J. INITIATE EDUCATION PROGRAMS

1. Develop consumer education programs to increase awareness of locally-grown produce.

2. Initiate educational programs on farmland preservation, farm energy conservation, reduced pesticide and fertilizer use, recycling of organic wastes, and energy expenditures in different methods of farming and home food production and preparation.

3. Promote nutrition education campaigns to illustrate the relationships between diet and health, and the benefits of fresh, seasonal, locally-grown and minimally processed foods, as well as bulk purchasing of food.

4. Communicate the goals and the condition of the state's food system as revealed in an annual study. (see I-3)

K. REVITALIZE FISHING INDUSTRY

1. Develop more direct marketing systems, including inland market options for surpluses.

2. Participate with other states and the Federal Government in keeping annual harvests below best estimates of maximum sustainable yield for all species.

3. Enact and enforce stricter laws regulating dumping of pollutants in marine waters.

4. Provide investment incentives for aquaculture within the state.

5. Implement a limited entry program that regulates fleet size in the shrimp industry to allow for increased production per vessel, reduced costs, and increased profits.

L. ENHANCE CONSUMER AND ENVIRONMENTAL SAFETY

1. Strictly enforce existing environmental protection laws.

2. Develop stricter standards for pesticide residues in foods and for proper labeling of products.

3. Continue to support the Florida's Pesticide Enforcement Grant Program that was initiated in 1979.

M. REDUCE DEPENDENCE ON TRUCK TRANSPORTATION

1. Reactivate the rail service in a way that employs piggyback and roadrailer forms. Florida now has numerous rail innovations on trial bases including the Road-Railer, the Truk-Train, the Four-Runner, and the Six-Pac.

2. Utilize water transportation for the major East Coast markets.

3. Improve truck back-haul efficiency.

4. Upgrade physical facilities at state farmers markets.

Recommendations—Counties and Cities

A. PRESERVE FARMLAND

1. Establish land-use management committees to make policy recommendations dealing with urban growth while preserving farmland. A Growth Management Committee now exists in Orange County.

2. Establish urban block farms that include housing units with areas set aside for farming, greenhouses, food storage, food preservation, recycling, etc.

3. Develop and adhere to land use plans as described under the Local Government Comprehensive Planning Act of 1975.

4. Adopt a Transfer of Development Rights program such as those implemented in Collier, Lee, and Palm Beach Counties, where landowners in agricultural retention areas can sell their development rights to landowners in developed areas. This allows developed areas to exceed previously set density limits within prescribed limits. TDR programs are best suited for actively developing areas.

5. Create agricultural open space preserves adjacent to a city's boundaries that preserve remaining prime farmland for agricultural use. Such designated areas fall under the Comprehensive Development Master Plan for Metropolitan Dade County.

6. Implement agricultural zoning as is currently used in Broward, Charlotte, Hillsborough, and Citrus Counties.

B. DEVELOP AND ENCOURAGE LOCAL FOOD PRODUCTION

1. Make publicly-owned lands that are suitable for food production available for community gardens.

2. Provide local tax incentives for home/community produced food.

3. Continue to support the Florida Community Gardening Pilot Program of 1980 facilitating long-term leasing of vacant lots to community groups for urban gardening and providing basic site improvement.

4. Subsidize gardens, or give start-up funds to establish gardens and/or greenhouses, in schools, prisons, hospitals, and nursing homes.

5. Establish community farms on their urban fringes to be worked by local farmers.

6. Encourage city agencies, as well as consumer groups, senior citizens and day care centers, hospitals, schools, and prisons to purchase food directly from local farmers and processors.

7. Promote contract growing (as practiced in Japan) whereby groups of urban families, or co-ops, or even the city itself, arranges to buy food directly from a local supplier.

8. Establish large-scale composting operations (such as the Bronx Frontier Development Corporation compost project in New York City) to turn vegetable, manure, and other organic wastes into compost for urban gardens.

C. DEVELOP AND ENCOURAGE LOCAL MARKETS

1. Encourage and assist the establishment of farmers markets, particularly in low-income neighborhoods, and facilitate authorizations for farmers to accept food stamps at the markets.

2. Help establish mobile farmers markets and fish markets to visit housing projects, neighborhood centers, apartment complexes and factories.

3. Assist the formation of buying clubs, food cooperatives, co-op stores, and preservation/storage centers.

D. DEVELOP AND ENCOURAGE LOCAL FOOD PROCESSING AND STORAGE

1. Sponsor community canning facilities where residents can preserve food inexpensively or free of charge.

2. Provide incentives to grocery stores to establish canning facilities for their shoppers.

E. FACILITATE ACCESS TO FOOD

1. Facilitate access to food stamps, emergency food outlets, and elderly feeding programs for those in need of these services.

2. Provide transportation to farmers markets and "pick-your-own" operations.

F. EDUCATE PEOPLE ABOUT THEIR FOOD SITUATION

1. Organize public meeting and /or educational programs explaining the importance of agriculture to urban areas, as well as offering classes in urban agriculture, aquaculture, container and rooftop gardening, food preservation, storage, and preparation, and nutrition. Wise food selection based on locally-produced foods should be taught in all classes.
2. Encourage public schools to include classes on local/urban agriculture.

Recommendations--Consumers

1. Purchase fresh, locally-grown fruits and vegetables at roadside stands, "pick-your-own" operations, and farmers/fish markets.
2. Grow more fruits and vegetables in home gardens.
3. Process and preserve home-grown or locally-produced food.
4. Join food co-ops or buying clubs that contract with regional farmers.
5. Try raising backyard animals like rabbits, chickens, or fish. Fish gardening in a backyard or basement pool can provide a family with up to 100 pounds of fish in a single growing season. Fish, chicken, and rabbits are all efficient converters of feed into meat and protein.

Recommendations--Producers

1. Explore direct marketing channels such as roadside stands, "pick-your-own" operations, and farmers markets.
2. Support a marketing system that would provide information necessary for decision making and identification of market alternatives.
3. Support regional warehouses and storage facilities that would grade, pack, and distribute the output of small local producers.
4. Explore the many marketing strategies: forward deliverable contract markets, exclusive agency bargaining, vertical integration through ownership, joint ventures between agricultural cooperatives and agribusiness marketing firms, marketing orders, and marketing boards.

5. Apply to the local soil conservation district for help in developing or updating a soil and water conservation management program.

6. Cut inputs by using better management practices, such as cropping systems that reduce the need for chemical fertilizers and pesticides.

7. Work for a change in those grading and marketing standards that are now outmoded. For instance, grass-fed cattle could greatly enhance Florida's meat production, but this meat won't grade "choice" according to current standards.

8. Start growing more of your own fertilizer in the form of nitrogen-fixing legumes and green manure crops. Use crop rotations that reduce the amount of herbicides needed, and biological controls to replace or reduce pesticide use.

9. Form marketing co-ops that could sell large quantities of food to organizations such as restaurants, schools, and other institutions.

Conclusion

Putting the most appropriate of these measures into practice could greatly increase Florida's food self-reliance and economic viability. Such changes also decrease our vulnerability in times of nutritional and international economic stress, and make Florida's food system more sustainable. The problems afflicting our food system are real, and they are growing each day. But there are solutions, and we still have the time to make changes. Without changes, the system will crash. With careful planning and action, the abundance we have historically known in Florida could continue. If Florida is truly concerned about the condition and future of its food system, then the state must be willing to spend the time and money to develop a realistic plan of action, and then to spend even more time and money to see this plan modified, accepted and implemented. The time to begin is now.

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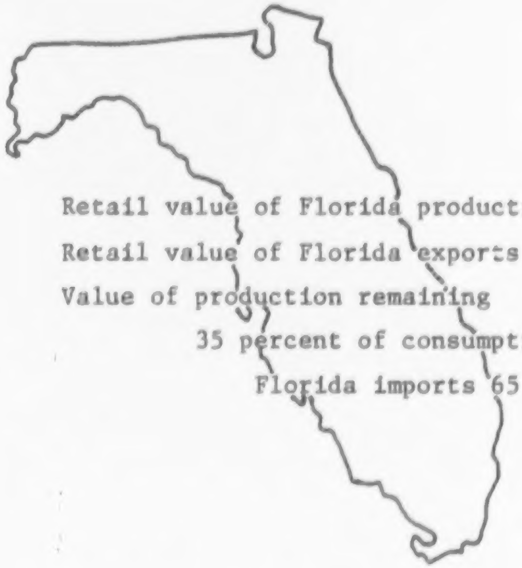
APPENDIX

FLORIDA FOOD IMPORTS

Everyone is familiar with the bounty of Florida, the sunshine state. This state grows 70 percent of all citrus fruits and 19 percent of all sugar produced in the United States. Florida ranks second only to California in vegetable production, and is the top domestic producer of winter vegetables in the eastern United States. However, this agricultural bounty hides some very serious problems in Florida's agriculture. Sixty-five percent of the food consumed in Florida is exported from other states. Each year, $250 million is spent on transporting food into the state.

However, Florida has the potential to expand its food system. Rather than exporting fresh fruits and vegetables and importing processed fruits and vegetables, as is currently done, canning and freezing companies should open facilities in Florida. In-state beef production could be expanded by the use of forage feeding programs, instead of feeding cattle grains that are often imported from other states. These and many other steps can be taken to provide Floridians with a safe, secure, efficient, and economical food system.



Retail value of Florida production	9,251,177.59
Retail value of Florida exports	5,980,365.80
Value of production remaining	3,270,811.79

35 percent of consumption produced in Florida

Florida imports 65 percent of its food.

FLORIDA FOOD IMPORTS

COMMODITY	PRODUCTION Retail Weight[a] (1,000 lbs)	Retail Value[b] ($1,000) (1980 dollars)	CONSUMPTION Retail Weight[c] (1,000 lbs)	Retail Value ($1,000) (1980 dollars)	% Import	Retail Value of Import ($1,000)	% Export	Retail Value of Export ($1,000)	Area Required to produce 100% of FL Consumption[d]
Meats									
Beef	110,048.02	256,411.89	745,110.00	1,736,106.30	85.2	1,479,162.57			4,649,486.40
Veal	10,603.59	32,553.02	14,610.00	44,852.70	27.4	12,289.64			e
Lamb and Mutton	14.45	36.12	12,662.00	31,655.00	99.9	31,623.35			6,590.73
Pork	22,291.95	28,979.54	665,242.00	864,814.60	96.6	835,410.90			1,178,794.20
Poultry									
Broilers	251,101.44	185,815.07	487,0[illegible].00	360,380.00	48.4	174,423.92			698,001.92
Turkey	insignificant		102,2[illegible].00	96,133.80	100.0	96,133.80			131,150.89
Eggs	397,410.00	218,575.50	337,00[illegible] 00	185,352.20			15.2	33,223.48	371,863.85
Fish[f]									
Blue Crabs	6,615.37	16,670.73	NC						
Lobster, Spiny	3,500.73	9,031.88	NC						
Oysters	2,792.82	13,992.03	NC						
Scallops	548.75	3,067.51	NC						
Shrimp	17,459.40	77,170.55	NC						
Total Shellfish (Includes shell fish not listed)	32,865.10	128,831.19	29,220.00	114,542.40			11.1	14,300.26	
Mackerel	7,121.70	17,946.68	NC						
Mullet, Black	15,390.12	9,541.87	NC						
Sardines	1,615.36	5,169.15	2,922.00	9,350.40	44.7	4,179.63			
Tuna	28.90	100.86	28,246.00	98,578.54	100.0	98,578.54			
Total Finfish (Includes fish not listed)	43,634.15	114,321.47	52,596.00	137,801.52	17.0	23,426.26			

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FLORIDA FOOD IMPORTS (continued)

COMMODITY	PRODUCTION Retail Weight (1,000 lbs)	PRODUCTION Retail Value ($1,000) (1980 dollars)	CONSUMPTION Retail Weight (1,000 lbs)	CONSUMPTION Retail Value ($1,000) (1980 dollars)	% Import	Retail Value of Import ($1,000)	% Export	Retail Value of Export ($1,000)	to produce 100% of Fl. Consumption
Dairy Products									
Fluid milk	1,886,040.00	565,812.00	2,220,720.00	666,216.00	15.1	100,598.62			847,693.30[g]
Butter	0.00	0.00	42,856.00	86,140.56	100.0	86,140.56			354,103.75
Cheese	0.00	0.00	171,424.00	371,990.08	100.0	371,990.08			516,362.00
Condensed & Evaporated Milk	0.00	0.00	69,154.00	39,417.78	100.0	39,417.78			57.642.20
Cottage Cheese	6,970.00[h]	5,854.80	43,830.00	36,817.20	84.1	30,963.27			18,934.30
Dry Whole & Nonfat Milk	0.00	0.00	34,090.00	68,861.80	100.0	68,861.80			32,736.55
Frozen Products	211,760.00	196,936.80	250,318.00	232,795.74	15.4	35,850.54			219,226.70
Vegetables, Fresh									
Artichokes	NA		2,922.00	1,314.90	100.0	1,314.90			NA
Asparagus	NA		2,922.00	7,889.40	100.0	7,889.40			NA
Broccoli	insignificant		16,558.00	16,392.42	100.0	16,392.42			1,971.19
Cabbage	353,409.30	106,022.79	81,816.00	24,544.80			76.8	81,425.50	3,400.22
Carrots	NC		59,414.00	24,953.88					1,980.47
Cauliflower	NC		12,662.00	12,662.00					937.93
Celery	458,118.00	201,571.92	71,102.00	31,284.88			84.5	170,328.27	1,760.82
Cucumbers	205,233.60	96,459.79	38,960.00	18,311.20			81.0	78,132.43	2,529.87
Eggplant	49,866.30	22,439.84	4,870.00	2,191.50			90.2	20,240.73	245.96
Escarole	70,401.00	95,041.35	5,844.00	7,889.40			91.7	87,152.92	485.99
Garlic	insignificant		7,792.00	24,622.72	100.0	24,622.72			599.38
Green Peppers	164,588.00	158,004.48	32,142.00	30,856.32			80.5	127,193.61	3,105.51
Lettuce	249,984.00	122,492.16	242,526.00	118,837.74			3.0	3,674.76	12,566.11

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FLORIDA FOOD IMPORTS (continued)

	PRODUCTION		CONSUMPTION						
COMMODITY	Retail Weight (1,000 lbs)	Retail Value ($1,000) (1980 dollars	Retail Weight (1,000 lbs)	Retail Value ($1,000) (1980 dollars)	% Import	Retail Value of Import ($1,000)	% Export	Retail Value of Export ($1,000)	Area Required to produce 100% of FL Consumption
Onions	insignificant		99,348.00	31,791.36	100.0	31,791.36			4,967.40
Peas, English	insignificant		1						
Potatoes, white	178,214.40[1]	40,989.31	480,182.00	110,441.86	62.9	69,467.93			24,751.65
Potatoes, sweet	insignificant		33,116.00	9,272.48	100.0	9,272.48			2,679.65
Radishes	105,105.00	86,186.10	NC						
Snap beans	117,678.60	81,198.23	12,662.00	3,736.78			89.2	72,428.82	4,742.40
Spinach	insignificant		6,818.00	12,681.48	100.0	12,681.48			1,704.50
Sweet Corn	431,106.48	176,753.66	64,284.00	26,356.44			85.1	150,417.36	7,118.94
Tomatoes	987,946.50	671,803.62	110,036.00	74,824.48			88.9	596,561.61	4,031.81
Vegetables, Frozen									
Asparagus	NC		584.40	1,893.46					NA
Broccoli	NC		13,636.00	13,499.64					2,159.00
Brussel Sprouts	NC		2,435.00	1,753.20					NA
Carrots	NC		9,058.20	6,431.32					503.03
Cauliflower	NC		4,480.40	4,480.40					474.59
Lima beans	NC		4,577.80	4,760.91					953.71
Onions	NC		6,623.20	5,099.86					264.93
Peas, English	NC		14,999.60	11,249.70					5,434.86
Potatoes	NC		164,606.00	111,932.08					18,836.36
Snap beans	NC		9,740.00	7,402.40					3,354.89

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FLORIDA FOOD IMPORTS (continued)

	PRODUCTION		CONSUMPTION						
COMMODITY	Retail Weight (1,000 lbs)	Retail Value ($1,000) (1980 dollars)	Retail Weight (1,000 lbs)	Retail Value ($1,000) (1980 dollars)	% Import	Retail Value of Import ($1,000)	% Export	Retail Value of Export ($1,000)	Area Required to produce 100% of FL Consumption
Vegetables, frozen (con't)									
Spinach	NC		7,305.00	4,821.30					1,826.25
Sweet corn	NC		18,798.20	14,474.61					7,702.39
Vegetables, canned									
Asparagus	NC		2,922.00	5,434.92					NA
Beets	NC		11,688.00	3,506.40					526.45
Carrots	NC		4,870.00	1,899.30					216.39
Lima beans	NC		2,922.00	1,461.00					304.38
Peas English	NC		32,142.00	10,928.28					7,917.65
Pickles	NC		67,206.00	49,732.44					6,269.75
Potatoes, white	NC		12,662.00	3,798.60					1,026.01
Potatoes, sweet	NC		9,740.00	6,915.40					1,094.27
Sauerkraut	NC		11,688.00	3,740.16					903.00
Snap beans	NC		60,388.00	24,759.08					11,110.14
Spinach	NC		4,870.00	2,191.50					1,096.97
Squash /pumpkin	NC		3,896.00	1,597.36					1,444.74
Sweet corn	NC		56,492.00	23,726.64					15,877.82
Tomato catsup, paste, etc	NC		117,854.00	71,890.94					595,993.72
Tomato puree	NC		9,740.00	4,090.80					40,545.87
Tomato juice	NC		29,297.92	6,445.54					57,356.31
Tomatoes, whole	NC		59,414.00	25,548.02					118,294.79

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FLORIDA FOOD IMPORTS (continued)

COMMODITY	PRODUCTION Retail Weight (1,000 lbs)	PRODUCTION Retail Value ($1,000) (1980 dollars)	CONSUMPTION Retail Weight (1,000 lbs)	CONSUMPTION Retail Value ($1,000) (1980 dollars)	% Import	Retail Value of Import ($1,000)	% Export	Retail Value of Export ($1,000)	Area Required to produce 100% of Fl. Consumption
Fruit, fresh									
Apples	0.00	0.00	155,840.00	99,737.60	100.0	99,737.60			NA
Avocados	48,880.00[k]	97,760.00	7,792.00	15,584.00			84.1	82,216.16	1,198.77
Bananas	0.00	0.00	202,592.00	68,881.28	100.0	68,881.28			
Cantaloupes	NC		64,284.00	28,284.96					11,893.43
Cherries	0.00	0.00	5,844.00	7,071.24	100.0	7,071.24			NA
Grapefruit	1,607,857.45	659,221.55	75,972.00	31,148.52			95.3	628,238.14	2,059.42
Grapes, European	0.00	0.00	35,064.00	37,869.12	100.0	37,869.12			Na
Grapes, Muscadine	2,400.00[l]	1,704.00	NC						
Honey Tangerines	131,181.70	38,042.69	NC						
Lemons	108,000.00	85,320.00	18,506.00	14,619.74			82.9	70,730.28	790.85
Limes	47,272.00	55,780.96	3,896.00	4,597.28			91.8	51,206.92	208.12
Oranges, Round	959,427.00	470,119.23	148,048.00	72,543.52			84.6	397,720.87	4,594.91
Peaches	56,400.00[m]	31,020.00	52,596.00	28,927.80			6.7	2,078.34	5,259.60
Pears	0.00	0.00	23,376.00	13,324.32	100.0	13,324.32			NA
Pineapples	insignificant		13,636.00	7,090.72	100.0	7,090.72			
Plums, Prunes	0.00	0.00	14,610.00	17,093.70	100.0	17,093.70			1,461.00
Strawberries	4,370.00	7,909.70	16,558.00	29,969.98	73.60	22,057.91			871.66
Tangelos	156,124.80	31,224.96	6,818.60	1,363.60			95.6	29,851.06	204.74
Tangerines	208,872.70	60,573.08	17,532.00	5,084.28			91.6	55,484.94	718.08
Temples	238,032.00	76,170.24	NC						
Tropical Fruit	28,750.00[n]	37,087.50	NC						
Watermelons	707,670.00	106,150.50	100,322.00	15,048.30			85.8	91,077.13	5,422.81
Fruit, Processed									
Canned & Chilled Non-citrus fruits	0.00	0.00	163,632.00	91,633.92	100.00	91,633.92			
Citrus Segments	58,091.52	39,502.23	7,792.00	5,298.56	86.6	34,208.93			478.28

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FLORIDA FOOD IMPORTS (continued)

COMMODITY	PRODUCTION Retail Weight (1,000 lbs)	Retail Value ($1,000) (1980 dollars)	CONSUMPTION Retail Weight ($1,000 lbs)	Retail Value ($1,000) (1980 dollars)	% Import	Retail Value of Import ($1,000)	% Export	Retail Value of Export ($1,000)	to produce 100% of Fl Consumption
Fruit Juice									
Orange:									
concentrate	2,312,570.00	2,428,198.50	88,244.40	92,656.62			96.2	2,335,926.96	18,897.78
canned/chilled	1,583,125.80	585,756.55	72,076.00	26,668.12			95.4	558,811.74	4,114.01
Grapefruit									
concentrate	190,541.40	270,568.79	NC						
canned	491,478.40	152,358.30	30,096.60	9,329.95			93.9	143,064.45	1,687.96
Tangerine									
concentrate	21,420.00	29,345.40	NC						
canned	503.20	125.80	389.60	97.40			22.6	28.43	29.35
Blended citrus	38,904.40	12,838.45	584.40	192.85			98.5	12,645.88	
Dried Fruits	0.00	0.00	28,635.60	71,016.29	100.0	71,016.29			
Frozen Fruits	0.00	0.00	43,635.20	45,380.61	100.0	45,380.61			
Fats and Oils									
Lard	1,910.40	1,012.51	24,350.00	12,905.50	92.2	11,898.87			
Shortening	NC		178,242.00	135,463.92					
Oils	NC		221,098.00	176,878.40					
Grains									
Barley	0.00	0.00	11,688.00	9,817.92	100.0	9,817.92			9,290.38
Corn Cereal	insignificant		22,402.00	24,194.16	100.0	24,194.16			22,129.64
Corn meal	insignificant		73,050.00	15,340.50	100.0	15,340.50			31,085.11
Corn syrup, sugar, starch	insignificant		529,856.00	365,600.64	100.0	365,600.64			334,179.70
Oats	0.00[o]	0.00	30,194.00	19,022.22	100.0	19,022.22			25,766.14
Rice	35,000.00	10,500.00	90,582.00	27,174.60	61.4	16,685.20			34,058.83
Rye (flour)	0.00	0.00	6,818.00	1,840.86	100.0	1,840.86			6,087.50
Sugarcane (sugar)	350,000.00[q]	175,000.00	563,946.00	281,973.00	37.9	106,867.77			97,013.22
Wheat (flour)	0.00[r]	0.00	1,139,580.00	205,124.40	100.0	205,124.40			728,065.00
Miscellaneous									
Coffee	0.00	0.00	68,180.00	143,859.80	100.0	143,859.80			NA
Honey	20,300.00	25,375.00	11,688.00	14,610.00			42.4	10,759.00	
Maple syrup	0.00	0.00	974.00	2,873.30	100.0	2,873.30			NA
Peanuts	79,508.00	162,991.40	59,414.00	121,798.70			25.3	41,236.82	41,132.77
Pecans	2,280.00	6,429.60	3,506.40	9,888.05	35.0	3,460.82			
TOTAL	15,835,260.65	9,251,177.59	11,852,657.92	9,459,166.53		4,967,468.95		5,980,365.80	11,452,553.62

FOOD IMPORT CHART NOTES

a. Using Florida Crop and Livestock Reporting Service, Florida Agricultural Statistics-Annual Summaries 1980: Livestock, Poultry, Dairy, Vegetable, Citrus, and Field Crops.

b. Prices supplied by U.S. Department of Labor, Average Retail Prices for the South (July-December 1980); Jacksonville stores-Food World, Publix, Pantry Pride, A & P and Winn Dixie; Orlando stores-Winn Dixie, Pantry Pride, and A & P; Walt's market, Sarasota; Dan Schantz Farm Market, Emmaus, PA; A & P, Allentown,

c. Using per capita consumption figures, USDA Food Consumption, Prices and Expenditures 1980 and Florida population 9,740,000.

d. For beef: William Lockeretz, Agricultural Resources Consumed in Beef Production 1975; for dairy: Dr. B. Harris, Professor of Nutrition, University of Florida.

e. By-product of the dairy industry.

f. Production values according to 1979 fish landings for east and west coast, edible weight (.6 x liveweight finfish) and (.45 x liveweight shellfish)

g. Land requirements for dairy products may be high due to double-counting of by-products.

h. Supplied by Pet, Inc.

i. Included in Minor Vegetables.

j. Estimate by Wayne Crain, Sweet Corn Exchange.

k. Supplied by Florida Lime and Avocado Administration Committee.

l. Supplied by T. E. Crocker, Associate Professor Fruit Specialist, University of Florida.

m. Ibid.

n. Florida Department of Agriculture and Consumer Services, Marketing Florida Tropical Fruits and Vegetables Summary 1980-81 Season,

o. Supplied by G. H. Snyder, Associate Professor of Soil Chemistry, Agricultural Research and Education Center, Belle Glade, Florida.

p. Florida produces 607 million pounds of soybeans, but has no soybean processors within the state.

q. Florida produces 21.2 billion pounds of sugarcane.

r. Florida has roughly 18,00 acres for corn silage; 360,000 acres corn for grain; 240,000 acres hay for livestock feed (1980).